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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XI. JANUARY, 1919. PART 1.

THE "QUEENSLAND AGRICULTURAL JOURNAL."

TO OUR READERS.

In July, 1897, the "Queensland Agricultural Journal" was launched by the then Minister for Agriculture, the Honourable A. J. Thynne, and the New Year 1918 seems a fitting occasion for a short review of its career of over twenty-one years. We are justified in believing that during that period the Journal has met with the unqualified approval of its readers, who comprise not only Queenslanders, but residents in every part of the globe. Thus we hear of its being found on the tables of North and South American and Canadian farmers, in the town and country homes of India, China, many European countries, in Africa, and in the Dominions of the British Empire, where it is greatly appreciated. The sole aim has been from the outset to fill the pages of the Journal with useful and instructive articles bearing upon agricultural, pastoral, horticultural, and other rural pursuits, and those mainly from the pens of contributors who are specialists in the various subjects they have written upon. Many very valuable contributions have been received from pastoralists, farmers, and others giving their own experience of new methods of cultivation, of the effects of different manures, irrigation, &c., also on experiments with new products. Many good inventions and ingenious contrivances for labour-saving have thus emanated from workers on the land. Information on such and kindred subjects have been and will be welcomed by the editor. Farmers are a busy people, and are apt, after a hard day's work, to be more inclined to rest than to sit down and write. There

are also some who do not like to write because they think they are not equal to writing a newspaper article. We do not ask for an elaborate article. Just give us the rough idea, and we will do the dressing-up part. There is many a gem of thought, many a brilliant idea lost to the world because the originator of it is possessed with the idea that he cannot clothe it in sufficiently fine language. If you have the good idea, never mind the language or the composition or the spelling. Leave that to us, and let your ideas be given to the world. Think how many people you may thus benefit. Every month the Department sends out several thousand copies of the Journal to various households all over the State, at the price of postage only. We may sum up the whole matter of agricultural education by the State, by saying that the objects the Department chiefly desires to promote are:— The education of both young and old in the technical and practical knowledge of Agriculture, Dairying, Poultry-raising, Stock-breeding, Fruit-growing, and kindred industries, and the formation of associations and bodies of farmers both for the attainment of objects of material importance to their welfare, and for providing an adequate means of giving expression to the general sense of that important section of the community.

A COUNTRY ROAD BOARD FOR QUEENSLAND.

In reference to the demand for the establishment of a Country Road Board for this State, the "Farmers' Gazette" for 23rd November quotes the following from the "Queensland Times" (Ipswich and West Moreton):—

"The suggestion is one which is certainly deserving of very serious consideration at the hands of all interested. If due consideration is given to the matter, it is quite within the bounds of possibility that something will evolve therefrom of a practical and beneficial character. The whole community is interested in the development as rapidly as possible of all our industries. It is generally admitted that it will be the success of our primary producers which will constitute the foundation of our national advancement. With natural advantages the State is liberally endowed. Not the least of these are the vast tracts of rich country which, in course of time, must be rendered productive, unless, meantime, they are 'captured' by a 'foe' like the prickly-pear. Development would be considerably stimulated if some workable scheme were devised by which at least reasonably trafficable roads could be constructed between the main highways—the railways—and the producing areas. Prospective settlers see no inducement to take up land in a new district if the prospects of being able to convey their produce to market are remote because of the lack of road accommodation. Some time ago, when urging the consideration of the matter upon the Government, Mr. H. J. Diddams, of Brisbane, who has taken a very keen and active part in local governing matters, made the point that, with adequate railways and main and developmental roads capable of carrying the ever-increasing traffic economically, safely, and with the least possible delay and discomfort, the revenue of the State would advance by leaps and bounds. There is certainly much in the contention, and it constitutes a very sound reason why there should be no unnecessary delay in giving serious consideration to the matter with a view to the creation of some workable scheme. This is one of many methods by which the development of the rural industries can be fostered."

Agriculture.

GOOD ROADS.

The road question is one of vital importance to farmers living at any distance from a railway station, and there are many splendid areas of arable land in all parts of the State which would become important centres of agricultural activities were it not for their inaccessibility, owing to the want of roads of communication to a railway. Some twenty-one years ago the Hon. A. J. Thynne, then Minister for Agriculture in this State, took up this question of road-making, and a series of articles on the subject, penned by him, appeared in the "Queensland Agricultural Journal" (Vols. XIV. and XV., 1904). A good article on road-making in farming districts was also published in Vol. XXI., 1908.

It will be interesting to farmers in the districts alluded to by Mr. Thynne to note how the pioneers of the agricultural industry fared then, owing to the want of roads ten years ago:—

"In the days when the Romans, under various emperors, extended their conquests to other lands, they invariably gave great attention to the construction of good military roads, especially in countries which they permanently occupied. These roads were so well constructed that they have lasted for over eighteen centuries, and are as good to-day as when the Roman generals, the soldiers, and the conquered peoples laboured at them. To construct such roads at the present day would be out of the question, for the cost of them would be prohibitive, no forced labour being available, as it was in Cæsar's day. Neither are such splendidly built roads necessary for ordinary country traffic. But, whilst we have been expending our energies and large sums of money in establishing an excellent railway system, we have most shamefully neglected our high roads. Time was when high roads and bridges were made, built, and maintained by the Government, and the main roads, at least, were kept in a good state of repair, because money could generally be found to carry out such public works, and to maintain them afterwards. The building of railways to the interior caused neglect of the main high roads. Coaches and wagons, bullock and horse teams being discarded for railway carriage, it was deemed no longer necessary to keep the road in repair. When the old road boards were done away with, there was no one to attend to the matter, and travelling by road became fraught with discomfort, damage, and danger. Nearly 100 years ago the United States Government was engaged in projecting and building extensive systems of public highways to develop the resources of the country, and probably that policy would have been continued but for the rapid growth of railway systems that seemed better adapted to the needs of the expanding business and the increasing traffic of the country. Within recent years there has been no adequate system for maintaining the highways in that country, and, as an American journal puts it, 'their condition in this age of general development is a disgrace to a civilised nation.'

"Now, an Office of Public Road Inquiries has been established through the Department of Agriculture, and this office is maintained by yearly appropriations from the public Treasury, resulting in great good in promoting road improvement, and there has been an increasing demand upon this office, not only for achieving aid, but for material assistance. In responding to the people's call for Government aid, there has been made a safe and healthy beginning, and the time is opportune for enlarging and extending the work in that country.

"In our State of Queensland the making and maintaining of the roads devolves upon the Shire Councils, who are empowered to levy rates for these purposes. In many parts of the country, such as in mountainous districts, as, for instance, in the Blackall Range and Main Range, and on vast stretches of deep alluvial or volcanic plains, such as the Darling Downs, the formation of good solid high roads is beyond the means of the Shire Councils, whose funds have many other calls upon them. A great many necessary public works in the various shires have to be carried out by the aid of loans from the Government, but these loans have to be repaid, together with interest. If loan after loan is granted, and repayment deferred to the Greek Kalends, then it practically amounts to the work being done, as in olden times, by the Government. It was precisely to avoid this that, together with other reasons, local government was established. The old system gave rise to many abuses

and easily obtained grants for local purposes were often diverted from the objects for which they were intended, and expended in some other direction. In some districts, the roads are a credit to any country, but when the highways are in such excellent order it will be found that the local conditions are all favourable to inexpensive, yet effective, road construction. The greatest trouble about roads exists in the farming districts, and in many of them road-making is limited to throwing up a heap of black soil, and building culverts over the worst gullies. Metalling the black soil road is useless under such conditions, and the Shire Councils are not in a sufficiently flourishing condition financially to incur the great expense of properly 'building' roads over the rich alluvial plains. During a continuance of dry weather there is no trouble with the plains roads, unless it be in districts where they are badly cut up by timber wagons; but in wet weather travelling by wheeled vehicles is next door to impossible. A glance at the illustration on another page, of a road in the Maroochy district, will show the sea of mud and water the uphappy settler must struggle through to reach the railway. The worst roads in this State are, as stated, in the hill country and on the blacksoil plains. It is possible to ride or drive over the latter during heavy rains; but when the soil begins to be less saturated, travelling, if not impossible, is exceedingly hard on horses and bullocks employed in wheeled traffic. In the mountainous country the farmer has to contend with very steep gradients, as well as with deep, adhesive mud. In the Blackall Range the pioneers of settlement were the timber-getters. Their bullock teams drew the logs from the scrub by the nearest route, irrespective of steepness, as the road to the railway is all down-hill, and the teams returning with empty wagons were able to negotiate the steep bush tracks. When the farmer came along, however, to settle on these lands, the question of roads became a very serious one. But those responsible for opening roads for the farmers contented themselves with improving the old bullock tracks, by taking out a few stumps, cutting down a very bad sidling, leaving a road so narrow as hardly to allow two carts to pass each other. And even where the worst steeps were reduced by heavy cuttings, the gradient in several places is 1 in 2. We have only lately seen a bullock dray, empty, drawn by sixteen bullocks, stopped twice on one of these long, steep hills, to rest the animals. Those who are learned in the traction power of draught animals have proved, by incontestible figures, what actual force has to be expended by a horse in drawing a certain load on level and on steep roads. It appears, by tables published by the Department of Agriculture of the United States, that a horse can exert a tractive force of 83.33 lb. for ten consecutive hours at the rate of 3 miles per hour. This means that he can move a ton for 30 miles in ten hours over a smooth, well-made gravel road. But taking a grade of 1 in 30 he can only move it 11 miles. If the gradient is increased to 1 in 10, he could only move it 5 miles. How far could he move a ton on such a road as that from Nambour to Dulong—where the gradients are so very steep? He could not move it at all. A settler at Mapleton has been bringing cedar in flitches down this range. His load, with four horses, does not exceed 600 ft. The distance is about 9 miles, and it takes the best part of two days to go and return. We do not enter here into the question of wear and tear on harness and wagon, which must be considerable. Then there is the loss of time to the driver. That is of as great importance as any other factor in the business. There are three ways of improving this state of affairs. The existing roads where these excessive gradients occur could be divided into sections of steep and level. If short level stretches were to succeed short pinches, before the strength of a team is exhausted by a long pull, the cattle would be on level ground, and there recover breath and move easily on to the next short steep to be negotiated. Thus the top of the range would be reached in shorter time, and with greater ease to the cattle. The second plan is to abandon the road where these steeps occur and contour the ridges. There is a piece of country running below the pinches we mention, where a road could be carried in 2 or 3 miles, which would not have a gradient of more than 1 in 30, and which would, in even a shorter distance, reach the objective point beyond the ridges. This is only a single instance of many mountainous roads in the State which we could point out. The third and best way of overcoming roads in gradient difficulty is the narrow-gauge tramline. Such a tramline has now been built in this particular part of the range, and an 8-h.p. motor-car has taken a load of 5 tons up the range at the rate of 3 miles per hour. We believe that not even 1 ton has ever been taken from Nambour to Mapleton by horse power and wagon.

"As for the black soil plains, the building of roads, as we have pointed out, is a matter of *naturæ locis*. Stone and gravel are plentiful in many parts of the Darling Downs, or of the Downs country of the Central and South-Western districts, and where such is the case excellent roads have been constructed, as witness the road running from Warwick to Freestone and Swan Creeks. Many persons know that for a long time it was deemed impossible to make a road of any kind across Chatmoss,

PLATE 1.—A SCRUB ROAD IN THE MAROOCHY DISTRICT.

in England. Millions of tons of stone were emptied into it to form a road for the railway, only to be swallowed up in its bottomless abysses. Yet, to-day, the trains run regularly across this shaking bog. The roadway was made of fascines, on which the sleepers, rails, and ballast were laid, and the road is as solid and firm as if it ran over rock. Our blacksoil plains are not bottomless. But if the top crust is broken, many more tons of broken metal would be required to form a firm road than if it ran over a sandy plain. Here fascines would come in. The road could be formed, drains made on each side, the surface laid with fascines, as has been done in the case of the training walls at the Hamilton Reach of the Brisbane River, and on these fascines a firm roadway could be built. We propose to continue this subject of good roads for farmers, as it is one of vital importance to them, and we shall endeavour to throw all possible light on it, in the hope that eventually the proverb about dropping water wearing away a stone will be realised in the determined effort of all Shire Councils to provide easy means for farmers to bring their produce to the various railways."

While much good agricultural land and land suitable for fruitgrowing and market gardening is found in this State, in districts where the nature of the country permits of the making of excellent roads at small cost, as, for instance, at Nundah and Nudgee, Oxley, Beenleigh, the neighbourhood of Ipswich, and many other favoured districts of East and West Moreton, as well as in some districts such as Warwick, on the Darling Downs, by far the greatest portion of the finest agricultural lands in the hill districts are almost inaccessible owing to the want of roads on which reasonable loads can be carried by horse or automobile power. The cost of ordinary road-making may be set down at about £800 or £900 per mile. A hill road in mountainous country would cost considerably more. Then there is the constant maintenance, for if a road is not kept in repair, especially when it is constantly cut up by the wheels of timber-wagons, it might as well not be made, for a bush road cut up into deep ruts and washed out by heavy rains is more useless and more dangerous than the ordinary bush tracks which may be avoided by constant detours. On a main road, the traveller is confined to the space between the watertables and the fences, and cannot avoid ruts, holes, boulders, and bogs. So long as the wheels of heavy wagons remain unchanged as to their narrow tires, so long will the cutting up of the roads continue, and the expenditure on repairs continue to be a serious burden on the taxpayer. For, be it remembered, neither main road nor any other roads branching from it bring in any revenue. Not only has interest to be paid on the initial cost of construction, but also that on the expenditure for repairs, both to the road and to the bridges and culverts. There is no revenue to be derived from these, except by means of that relic of the dark ages—the toll-bar. The infliction of toll-bars would be justly resented by the travelling public.

Much wear and tear of roads would be avoided if all vehicles carrying heavy loads, such as timber, wool, minerals, &c., were compelled to adopt a broad tire. In some parts of the State the broad tire has been adopted with much benefit.

At the Agricultural Conference in Maryborough in July, 1903, the Hon. A. J. Thynne, M.L.C., read a most interesting paper on "Queensland Country Roads." During the discussion which followed, Mr. Atkinson, of Danderoo, said:—

"The question of road-making and good roads is a very big one, and the difficulty our shire councils have to encounter is the fact that they have so many roads to attend to. Our shire council is in a pretty wealthy district, and has been very sympathetic to the farmer. . . . . As for road-making generally, there is no doubt that a lot of money is wasted for want of a little more. Farmers would help themselves if they adopted the broad tire. I am by trade a wheelwright and coachbuilder, and can say that the general introduction of broad tires will do as much as anything to solve the bad road difficulty. The broad tire is the very best that you can put on farm lands, and when I started farming the first thing I did was to build a dray with 4-inch tires. I wanted 5-inch, but there was a difficulty in getting them. It is the lightest dray in my part of the district, yet I can guarantee to take on it a bigger load to the railway with one horse than any other man on the countryside. The local authorities could do much to encourage the use of broad tires. If there were a tax put on all new 3-inch tires, we should soon get wider ones. When the wheelwright firm I was in first went to Hughenden, we found the 3-inch tire was the standard, and we said to the woolmen: 'Go in for wider tires.' When we left there we had instituted the 6-inch tire—the greatest road-maker ever introduced onto the blacksoil plains."

A wheel tax is also imposed in some districts, but still the problem of cheap, useful roads, in constant good repair, has not been solved. When a railway passes through a country district, the main road is at once neglected, it being supposed that people will naturally employ the railway for the carriage of heavy goods. And

doubtless this is largely the case; but railway stations and good sidings are not built at every man's sliprail, nor will a train pull up anywhere and everywhere for the pubic convenience or inconvenience. Therefore, the main road is still required to enable people living at a distance from a railway station to carry their goods to and from it.

The remedy for this state of affairs lies in the substitution of light railways or tramways for metalled or unmetalled roads. The cost of a tramline, on the narrow 2-foot gauge system, even in hilly country, does not amount to more than from £800 to £1,000 per mile, about the same as the cost of an ordinary road. But the tramline service is productive of revenue. Wherever tramlines have been built they have usually paid their way, or, if they have not done that, they have gone so near it that the deficiency bears no proportion to the annual outlay on the highroads. The cost of maintenance is also much less, once the line has been faithfully built. On level country trams may take the place of trains, travelling, certainly, at less speed, but, nevertheless, conveying goods and passengers in certainty and at regular times to their destinations. The running of a train of tramcars capable of carrying from 20 to 30 tons would necessitate the employment of but two men, as in the case of street cars. If those 30 tons had to be carried by wagons drawn by horses over bad roads they would employ thirty horses and fifteen drivers. In heavy weather and on boggy roads the team could often not travel at all, but the tram train would not be hampered with such considerations, except at such times as when heavy floods occur; and even then the tram has the advantage, as, even before the water has completely left the track of a line in flooded country, the cars could run, whereas the wagons would have to remain until the sodden roads became hard enough to bear their weight.

Mr. Thynne, in concluding his paper, gave a table of gradients between 1 foot in 10 and 1 foot in 30, showing how much the hauling power of a horse is affected by the grade of a road as compared with his hauling power on a level road of the same quality, which is taken as represented by the unit 1:—

TABLE OF GRADIENTS.

Inclination.	Angle.	Rise in Feet per Mile.	A Horse can Draw—
1 in 10	5·43	528	0·25
1 in 11	5·11	480	0·265
1 in 12	4·46	440	0·28
1 in 13	4·24	406	0·295
1 in 14	4·5	337	0·31
1 in 15	3·49	352	0·325
1 in 16	3·35	330	0·34
1 in 17	3·22	310	0·355
1 in 18	3·11	293	0·37
1 in 19	3·0	277	0·385
1 in 20	2·52	264	0·4
1 in 24	2·23	220	0·5
1 in 25	2·18	211	0·52
1 in 26	2·15	203	0·54
1 in 30	1·55	176	0·64

Thus it appears that, if on a level road a horse can draw 1 ton, he can only draw 5 cwt. up an incline of 1 in 10, or about 12 cwt. up an incline of 1 in 30. He could only draw about 6 cwt. up an incline of 1 in 17. The little motor on the Nambour tramline can take 5 tons up an incline of 1 in 17.

NATIONAL ROADS ASSOCIATION OF NEW SOUTH WALES.

"Local Government," a Queensland publication, lately published the following particulars of the work of the National Roads Convention recently held in Sydney, when the following resolutions were passed:—

"1. *Main Roads.*—That this conference, being of public representative character and not concerned in the domestic management of by-roads by the local councils, limits itself entirely to the consideration of main roads.

"2. *National Importance of Good Roads.*—That this convention is of opinion that the present condition of the main roads causes incalculable loss to the business community and excessive inconvenience to the general public, and, therefore, that it calls for the inauguration of new methods of construction, maintenance, and administration.

"3. *Development and Decentralisation.*—That this convention urges the adoption of a main road policy which will insure:—

(*a*) The connection of large producing districts with their shipping points, whether on river, coast, or rail;

(*b*) The establishment of through routes of communication between the capital and the country districts;

(*c*) The establishment of a properly thought-out system of metropolitan main roads giving access not only between city and suburbs, but also between suburb and suburb.

"4. *General Policy of Control.*—That this convention affirms the principle that there should be a continuous thread of Government guidance and control running through the main roads policy, and that that policy, subject to the aforesaid guidance, should be based upon co-operation between the Government and the local councils.

"5. *Apportionment of Upkeep.*—That when the main road is once properly constructed there shall be a definite policy laid down as to the future apportionment of the cost of its upkeep.

"6. *Durable Construction.*—That upon main roads it should be the set policy to construct only in a thoroughly substantial manner, as that will yield the truest economy in the long run.

"7. *Grading and Location.*—That upon main roads there should be a constant endeavour to secure the best location, grading, and drainage, and that, in any position where it is known that the location, grading, or drainage could be improved by a re-location, whatever money is available shall be reserved for the construction of the deviation rather than the patching or improvement of the existing road.

"8. *Each Road a Complete System.*—That every main road should be dealt with as one continuous means of transit right through the whole of its length.

"9. *A Main Roads Board.*—That for the purpose of the previous resolution there should be a Main Roads Board established, which shall have power to declare what are main roads and to distribute among main roads the money votes of Parliament therefor, to co-operate with and subsidise the local councils in order to secure the construction and maintenance of main roads, and to construct and maintain main roads in case the local councils make default in that respect.

"The powers of the Main Roads Board are briefly: To resume land for road resumptions, deviations, and quarries; to construct and maintain main roads, hire or sell road-making plants to shires and municipalities, and to maintain ferries; to test road materials and methods of road construction and maintenance; and, where deemed wise, to engage in the manufacture of road-making material.

"As to the constitution of the board, it is to consist of a president (who shall be a business man), two Government representatives, one of whom shall be a highly qualified engineer, and the other a representative of the vehicle and motor taxpayers; one representative of the shire council, and one representative of the municipal council.

"The cost of construction and maintenance of main roads is to be shared between the various councils and the Government, through the Main Roads Board.

"Amongst the sources of revenue for these purposes are the present main roads vote, the proceeds of motor licenses and taxation, a gneral graduated wheel tax on all vehicles. The main roads boards in connection with the metropolitan area are to have power to levy by requisition upon the local councils, but in no case is such levy to exceed ½d. in the £1. The Main Roads Board is also to have power to borrow a sum not exceeding £2,000,000, in such sums as the Minister may from time to time approve.

"The conference affirmed the desirability of legislation governing the width of tyres. In the case of two-wheeled vehicles, if the width of the tyre be less than 3 inches the maximum weight of vehicle and load together must not be more than 2 tons; tyre 4 inches, weight 2½ tons; 5 inches, 4 tons. In the case of four-wheeled vehicles, if the width of the tyre be less than 2½ inches, the weight may not exceed 2 tons; tyre 3 inches, weight 2½ tons; tyre up to 5 inches, weight 5 tons; 7 inches, 12 tons. Where a vehicle is hung on springs, the weight of the load may be increased by 5 per cent.; but in no case can more than 4 tons be carried on a two-wheeled vehicle, or 14 tons on a four-wheeled vehicle.

"A percentage of the proceeds of all sales of Crown lands to be set aside and added to the main road vote. In view of the close relationship between the railways and the roads, the latter acting as auxiliaries to the railways, provision should be made to allow of all road-making materials and machinery to be carried at special rates.

"When any person shall damage a road by any extraordinary or unreasonable use of it, the cost of repairs may be recovered from such person.

"That for educational purposes, an inquiry should be conducted by the Government to place on record the actual figures of the saving effected and the increase in land values following upon road construction, and that such information be widely disseminated.

"That all bodies with statutory powers consult the Main Roads Board before opening up any main roads, and that they be compelled to replace the road in an efficient state of repair."

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS—No. 1.

By P. MAHONEY, Cooper's Plains.

FOREWORD.

Having had a considerable amount of experience in one of the largest irrigation settlements in Australia, I consider it is only fair that I should share my experience with any farmers to whom it may prove of any use, as I myself have derived much knowledge on different subjects through this same medium under similar circumstances.

LAYING OUT AND GRADING.

To make a success of irrigating, it is necessary to know how to lay out the land intended to be irrigated, the means of conveying and utilising the water, and the art of cultivating thoroughly, which is closely connected with successful irrigation.

The land must be thoroughly graded—that is, the surface of the land made level. Even on hilly land it is necessary that it be graded, for any lodging of surface water in hollows, &c., is detrimental in several ways, viz.:—It is apt to bring on seepage through excessive water and bad drainage, which is disastrous, and if water is allowed to lie on the ground during a hot day there is a possibility of the plants being killed owing to the water getting too hot. The over-supply of moisture to the plant causes, in many cases, forced growth, which is not beneficial to the fruit, &c., for it impairs their keeping qualities; consequently, the carrying qualities are not so good.

The direction in which the land is to be irrigated should be decided upon according to the nature of the soil, for the looser the soil the greater the fall should be, as it absorbs the moisture in quicker time than heavy soils. Therefore, it is necessary to have the fall in the land accordingly. It is considered that from 6 to 9 inches of a fall to the chain in sandy rises is most convenient, and that on heavy soils 4 inches or even less is considered enough. Never should the rows to be irrigated be any longer than 5 or 6 chains, for if so, the plants at the top end are likely to get an over-supply of water before the water has reached the bottom ones, which, of course, is dangerous.

In growing fodders, such as lucerne, wheat, &c., it is necessary to have the land practically level, for the only way of watering such crops successfully is by flooding, although hilly land can be made to grow such crops satisfactorily by terracing the lands; but this is much more expensive than preparing flat lands. After the land has been graded and ploughed, it is essential to build check banks, to afford a thorough watering. These banks can be made so as to permit the mowing machine to be driven over them while in action. This is necessary, as crops can be grown upon them. These banks should be about 8 inches high, and should not be made abrupt. The best and quickest way of making them is by ploughing six furrows, three one way and three in the other direction, having the two middle furrows overlapping one another, then drawn up with the disc cultivator, or by repeating the ploughing again after harrowing. Effective and serviceable check banks can be made in that manner.

Land to be irrigated by flooding should be divided into quarter-acre patches (by such banks), which will be found to be the most serviceable size. If the land has a slight natural slope, it is advisable to divide if off into narrow beds running with the fall of the land. In this manner it can be watered satisfactorily. It is necessary to have pipes in these banks so as to allow the water to flow from bed to bed.

There are several different kinds of implements used for the grading of land. If the latter happens to be very rough, a buckscraper or scoop is necessary, for with this implement it is possible to grade any land for irrigation, but if only slightly bumpy, a "slicker" will do the work. A slicker is a home-made instrument consisting of two hardwood planks about 8 feet long by 1 foot wide, fastened together about 2½ feet apart, the front plank having a slope outwards, and the back, a slope in the reverse direction, with the bottom edges sharpened, so that they will grip the soil and carry it from the bumps, and drop it into the hollows. Suitable boards should be fastened on it so that the driver can stand comfortably. This implement should be drawn by two horses, and it is necessary for the driver to stand on it while working. Harrows with a piece of board fastened in front of the back tines will do good work (when the land is not rough) when standing upon them and driving across the mounds, then getting off to release the soil after passing over them.

If the soil has to be carried any distance, the buckscraper will have to be used, as the slicker will only drag the soil for a sort distance.

A good way of ascertaining the level of a piece of ground is by the use of a spirit level and boning rods.

[TO BE CONTINUED.]

IMPROVED METHODS OF DRYING AND MOUNTING PLANT SPECIMENS.

By H. W. ANDREW, Botanical Assistant, &c.

Several requests having been made for details concerning the methods adopted by this Department in preparing and mounting plant specimens for exhibition and demonstration purposes, it has been decided to publish particulars for the information of those who may be interested. While the study of the plant in the field, where practicable, is much better, the use of well-dried and mounted specimens has many advantages. The botanist and the agricultural teacher will always have to depend largely on herbarium specimens for reference and general educational purposes. The methods described below embody two or three details which, so far as South Australia is concerned, represent quite new features of the agricultural educationist's work in this direction. The specimens completed for departmental use cost under 2s. 6d. each (exclusive of time and labour absorbed in collecting and drying the plants). They are light, portable, practically unbreakable, dust-proof, &c. The transparent celluloid facing accommodates even bulky specimens, and at a cost much less than glass.

PLATE 2—PLANT PRESS.

Certain district councils, Agricultural Bureaux, and other institutions have applied to the Department for sets of the proclaimed noxious weeds. These will be supplied by the department at a cost of about 2s. 6d. per specimen. The exhibition of these in council chambers and such places should do much towards clearing up the confusion existing in the minds of so many people respecting the identity of even common plants.

DRYING SPECIMENS TO PRESERVE COLOUR, ETC.

This involves the employment of sheets of cotton wadding placed in several layers between two wire netting trays or grids, having a mesh of about ½ in. The netting is framed with heavy-grade galvanised iron 2½ in. wide before the latter is doubled over to hold the netting. The required pressure is applied by means of leather straps. The overall measurements of such a press for general purposes

PLATE 3.—MOUNTED SPECIMEN, AS SUPPLIED BY DEPARTMENT OF AGRICULTURE FOR REFERENCE.

may conveniently be 12 in. by 17 in. In the hottest sun seven or eight layers of plants have been dried successfully in the one press, and in cold, damp weather, with the use of an electrically heated oven, possibly still better results have been obtained, the plants being dried in a few hours. In the case of plants with conspicuous flowers, it is desirable to detach and dry the flowers in a separate press, so that leaves, &c., shall not come in contact with them. Tubular flowers are best treated by filling with small pieces of cotton wool, and where petals overlap one another, pledgets of cotton wadding should intervene. Detached flowers are probably best mounted by narrow strips of transparent adhesive paper.

There can be no question that such a press is admirably suited for the drying of plants (as well as flowers, for which a somewhat similar press has been used and described by Dr. Claud F. Fothergill, of England), the natural shape and colour being retained to a remarkable degree. Such a press might with advantage be

carried into the field when collecting. The specimens, of course, may be left in the press undisturbed until completely dried, so that the old, time-absorbing method entailing the frequent changing of blotters, &c., is obviated. The sheets of cotton wadding employed here have been in use almost daily for twelve months, and are still in a serviceable condition. The finished or smooth side of this material should come in contact with the specimens, otherwise considerable trouble may be experienced in getting rid of the wool from the sticky, hairy, and prickly plants.

MOUNTING SPECIMENS.

"Two-pounder" strawboards (about ⅛ in. thick) are used, size 12 in. by 17½ in. Suitable white paper is pasted to either side to restrict warping and add to the appearance of the mount. As it is important to familiarise farmers and others with the appearance of weed seeds or fruits (in addition to the plants themselves), a hole is punched through the cardboard to accommodate them, and a small separate piece of celluloid is placed over the top of the hole, before pasting paper referred to above over the face of the mount. After the seeds are placed in this pocket, from behind a piece of gummed cloth is stuck on to keep the seeds intact. The specimen after drying, is carefully arranged and fastened to the mount by means of transparent adhesive paper, and the mount labelled. The mount and its specimen are then fumigated with carbon bisulphide for sixteen hours, and immediately afterwards the whole is covered with transparent celluloid by gumming the latter to a narrow strip of binder's cloth and afterwards sewing together to further strengthen it, finally framing by gumming the free edge of the cloth to the mount. It might be pointed out these mounts may be used to advantage in showing specimens other than weeds, such as wool, insects, &c.—"Journal of Agriculture, South Australia."

THE COMING WHEAT CROP.

In Melbourne they are indulging in a forecast of the approaching wheat harvest of the Commonwealth, placing it at 68,000,000 bushels, as compared with 115,000,000 bushels last harvest, and with 152,000,000 in 1916-17. The Victorian yield is placed at 24,000,000, and New South Wales and South Australia at 15,000,000 each. The Queensland crop is estimated at less than 20,000 bushels, severe drought conditions being responsible for decreased crops even in the most favourable wheat-growing districts. The wheat harvest for the year 1916-17 totalled 1,035,268 bushels. The area under grain is known to be reduced, and the season has been too dry, so that the yield is expected to be considerably less. But forecasts before the grain is cut are apt to be very unreliable. Such a harvest would give little more than another 30,000,000 bushels for export.

CHANCES OF LIFE.

The "New Zealand Farmer" asks—Which would you rather be, a new-born babe or a soldier in the trenches? In which condition would your chances of living a year be greater? This sounds like a foolish question, says Mr. G. E. Earnshaw, in the "Infants' Department" (Chicago). One would naturally suppose that a baby, sheltered in the home, and tended constantly by the loving hands, would have a better chance of living than a soldier on active service. And yet the contrary is true. The perils of shot and shell, of bayonet thrusts and bursting hand-grenades, of disease from exposure or infection—all these exact a toll of life considerably less than that paid by the nurseries. Out of every seven babies born, one dies before it is a year old. One in seven is more than fourteen in the hundred. So the soldier, braving disease and death in the camp and on the battlefield, has a seven times better chance of life than the newborn baby. Out of the 2,500,000 babies born every year in the United States, more than 350,000 die before they are a year old. Of the same number of soldiers, only 50,000 will die in a year as a result of their exposure to the risks of war. Terrible as is the toll of life exacted by war, the losses suffered by our infant population through improper foods and clothing, the ignorance of midwives, and, alas, of mothers also, is yet more terrible.

Pastoral.

THE CLARIFICATION OF WATER IN LARGE DAMS.

Application is occasionally made to the Department of Agriculture and Stock for information as to the best method of clarifying the water in large dams which has become foul through the constant access of live stock, the washing in of the soil, or other causes. It frequently happens that where the dam is not fenced the water speedily becomes very foul and quite unfit for the use of animals. This can be generally prevented by carefully fencing off the same and allowing animals to enter only a sufficient distance to satisfy their requirements, or, what is better, by enclosing the whole with a strong fence, and pumping the water into drinking troughs by windmills or other means.

If the water is highly charged with organic matter, and is foul to the senses, an effective method of procedure is as follows:—

Obtain a number of boxes about the size of small fruit cases, and perforate the bottom and sides with $\frac{1}{8}$ in. holes. Partly fill these boxes with a mixture of commercial alum and sulphate of iron in equal parts. Attach the boxes to wires or strings and pull them backwards and forwards across the surface, so that a fair quantity will be dissolved, which will at once cause a precipitation of the foul matter and leave the general body of water clean and practically free from impurities. The only thing still required to make it fit for domestic use is to aerate and charge it with dissolved oxygen, which can be done by passing it through a spray and a fine sand filter.

ARTHUR MORRY,
Surveyor, Department of Agriculture and Stock.

THE COMING OF THE FRIESIAN.

In every State of the Commonwealth interest in the great black and white breed is increasing. There are more breeders in Queensland than in any of the other States, but the largest herds are located in New South Wales, and the best herd that this paper knows is in Victoria. On all sides one hears the question: "Has the Friesian boom come to stay?" It is not a boom. Indeed, we have been slower to realise the worth of the Friesian than any other dairying country. Comparatively we have but a handful of the breed in Australia. In New Zealand the Friesians lead the way. In America, as is well known, they have done wonderful things, and it is no exaggeration to say that they are the most popular breed. In England they are making great headway.

It is difficult to keep up to date in recording the performances of Friesian cows. No sooner is one record made than it is broken. It is

not so long ago that we were astonished to learn that a Friesian calf had sold for £2,000. Then came the announcement that a six-months' old bull had sold for £20,000. Sales of heifers at £3,000 and £4,000 each is quite a common thing in American Friesian circles. These top figures are not got by the small farmer, but there is plenty of evidence that well-bred, high-testing cows find ready sale at around £200 each.

What is the reason for this prosperity? In the first place, of course, the breed has established some remarkable records. Several cows have made over 40 lb. butter per week. One cow has a record of over 50 lb. of butter per week—think of it! But that is not the only reason. The main reason is that dairymen are finding the Friesian a prepotent bull, a bull that can transmit to his heifers his superior milk inheritance. As one writer on the subject has said: "The Friesian breed has proved itself supremely adapted to the up-building of the scrub cow. This was demonstrated by the series of experiments carried on at the Iowa station. One cow averaged 3,255 lb. of milk and 161 lb. of butterfat during the year. Her daughter, sired by a Holstein bull, produced 6,311 lb. of milk and 261 lb. of butterfat. Her gain over her dam was 94 per cent. in milk and 62 per cent. in butterfat production. These daughters were bred again to Holstein sires, and their daughters produced an average of 11,295 lb. of milk, or a gain of 245 per cent. over their granddams, and their butterfat production was 431 lb. or 168 per cent. more than that of the old cows. The practical farmer usually begins with a purebred sire, and perhaps one or two purebred cows. He will find that the breed for him to choose is the breed that is so strongly developed along the line of production that the offspring of the sire when mated to common cows will be endowed in no uncertain manner with the ability to produce."

We have far to travel in Australia, but we have started on the way, and, as far as this paper is able to judge, the future of the breed is in good hands.—"Farm Bulletin."

GREAT FRIESIAN SALE.

Great prices were seen at a Friesian sale held in England on 5th September, the sum of £20,674 being obtained for the eighty-seven lots offered. The beautiful imported cow Golf Sietske 10th made top price, 4,500 guineas, to Mr. A. S. Bowlby, of Harlow (England). This cow has every attribute of a champion and breeds beautiful stock, while she startled Friesian circles by yielding 6 gallons in one day with her first calf. The price is higher than that made by any female in Great Britain and equals that paid for the most expensive bull in the golden days of the Shorthorn.

FARMERS' WOOL CLIP.

ADVANTAGES OF SKIRTING AND ROLLING.

BY R. WILSON, Assistant Instructor in Sheep and Wool.

(*Continued from December issue.*)

A properly prepared clip is one in which all lines are even and regular, which facilitates full values being paid for the various types.

The reason a fleece is skirted is to allow the buyers to get what they want without having to take wools unsuitable for their requirements.

If a wool were very seedy or burry, it would be better to skirt off the very rough and scraggy edges, for if you were to skirt off all seed and burr from a very burry fleece, all that would be left would be the back with a small proportion of side, which would be cutting into your fleece wool too heavily.

The treatment necessary for all wools is to skirt as lightly as possible without leaving the low quality wools on the fleece, in respect of which the owners must use their own discretion, as the conditions vary so much under which different clips are grown. If the fleeces are but lightly touched with seed or burr, effective skirting will do away with that objection so far as concerns the fleece.

Stained wool, such as ewe breach stains caused by urine, or canary-yellow stained wool peculiar to certain districts, must be removed.

The pieces skirted off should be carefully picked over, and if the number of sheep should warrant it, be sorted into broken pieces and stains; the broken, to contain the bright, light-conditioned, bulky pieces, while the pieces would consist of the small, duller, and heavier-conditioned pieces. The stained wool should be kept by itself. In a small, or farmers' clip, it is only necessary to make one line of pieces, with stains removed.

As the necks of most fleeces are generally lighter in condition and bulkier than the pieces, they could be packed separately in a large clip, but such treatment could not be recommended for a small grower on account of cutting up his already small lines.

In all cases, belly wool should have the stains removed and be packed separately. The practice of packing belly wool with both fleece wool and pieces is far too prevalent, even with small clips of otherwise good quality. Belly wool is not used for the same purpose as fleece wool; therefore, there is no reason why a grower should deprive himself of the competition in that section of the trade which buys wool for the highest purpose of manufacture and pays most for suitable wools.

ROLLING.

The advantage gained by rolling fleece wool is that it gives the wool a better appearance when opened up for exhibition.

The method of rolling is to first throw out the fleece on the wool table with *skin* side down, when it is skirted as required and side-folded over across the table to the roller. Then turn in the neck and breach, and roll from breach to shoulder, at the same time tucking in the back and edges of the fleece, when you can tie by drawing out of the shoulder enough wool to turn and tuck into the fleece, when the latter will be found to hold together as rolled.

When rolled, the shoulder, which is the best wool of the fleece, should be showing.

Care must also be taken that the pressers do not break the fleeces in carrying them from the bins to the press, unless such wool is to be scoured before being offered for sale. If they were allowed to be broken, it would nullify the object for which they were rolled. The treatment of crossbreds is much the same as in merinos. The larger the clip the greater the opportunity offered for effective work in connection with skirting.

The owner must at all times be guided by the size of his clip, but, be the clip ever so small, different qualities should be packed in different bales.

Therefore, the advantage of skirting and rolling can readily be seen, as it tends to increase competition and to ensure better values for the grower when opened up for sale.

A BEGINNER WITH SHEEP.

A correspondent of the "Journal of Agriculture of South Australia" who states that he is a "green" Englishman owning about 700 acres of land in South Australia, divided into three fields, each about 200 acres in extent, and a home paddock of 20 to 30 acres, proposed to adopt a rotation of fallow, crop, feed, the sandhills of the fallow paddock to be sown during the following year to a forage crop, say, peas or barley (fully 30 acres), half of the feed paddock to be sown to oats and barley for early feed, and 20 tons of hay to be reserved for hand-feeding, if necessary, in dry seasons. The small paddock (a low-lying flat) he proposes drilling with oats and wheat mixed for hay this season, and broadcasting lucerne.

The Director of Agriculture (Professor Arthur J. Perkins), to whom this communication was referred, replies:—"I am afraid that if I were to deal adequately with all the points raised by you in your letter, my reply would run the risk of going into volumes. I cannot pretend, therefore, to more than make a few general remarks on the subject.

"In the first place, it is quite impossible for anybody to give you any idea of the number of sheep you can carry on a farm, unless the person advising you has personal experience and knowledge of the farm in question. If you are quite without experience in the management of sheep, one point of advice that I certainly can give you is not to aim at maximum, or anywhere near maximum, carrying capacity. A beginner should always understock, and never incur the risk of overstocking. Your best method, in the absence of previous experience, would be to secure a small flock of ewes, and gradually build up, increasing your flock as your experience becomes greater. Probably, in your case, fifty ewes would not be out of the way; but I should hesitate to handle a greater number at the outset. In a general way, of course, young ewes are to be preferred to cast old ewes, chiefly because the older ewes will need to be fattened off comparatively early, otherwise they run the risk either of dying or of becoming unsaleable from the difficulty of adequately fattening, but with present prices, and the difficulty of securing sheep at reasonable rates, I am of the opinion that you should take advantage of any sound-mouthed ewes you can secure at reasonable rates. You should give preference to large, well-developed sheep, selecting for the purpose either merinos or crossbreds, and unless your fencing is faultless, I certainly recommend merinos. Any type of English rams would suit your purpose—for fat lambs, Southdowns, Shropshire, or even Leicester. The main point is, that the ram should be well bred. You should endeavour to secure a two-tooth ram; older ones are always less satisfactory.

"In the matter of hand-feeding, I am of the opinion that you will often find grain more advantageous to feed to sheep than chaff; I refer to oats or barley grown as a second crop after wheat, which itself had been grown on bare fallow. Grain is easily handled and distributed to sheep, and is not liable to be blown about by the wind, as is the case with chaff. Bear in mind, however, if you are driven to hand-feeding, that you should not delay hand-feeding operations until your paddocks are bare. Hand-feeding, if likely to be necessary, should be anticipated a couple of months before it becomes actually necessary; it will enable you to stretch out the feeding capacity of your fields, providing the sheep with both concentrated food and roughage, which is more or less essential to them."

AUSTRALIAN HONEY SUPPLIES.

Something like 3,000 tons of honey are stored in Australia, mostly on speculators' account (says the Sydney "Daily Telegraph"), awaiting export. The authorities, however, will not make shipping space available for honey, though the prospects of the position in this respect being relieved are now rather brighter.

Mr. Mears, general manager of the Coastal Farmers' Co-operative Society, and president of the Chamber of Commerce, states that, if shipping space were granted, honey could be shipped to London on consignment, and would be assured of ready sale at high prices. The C.F.S. has been advancing shareholders 7d. per lb. on their honey while awaiting shipment, which, of course, is considerably in advance of the rates for local sales, and compares with the 4d. to 4½d. paid some months ago by speculators.

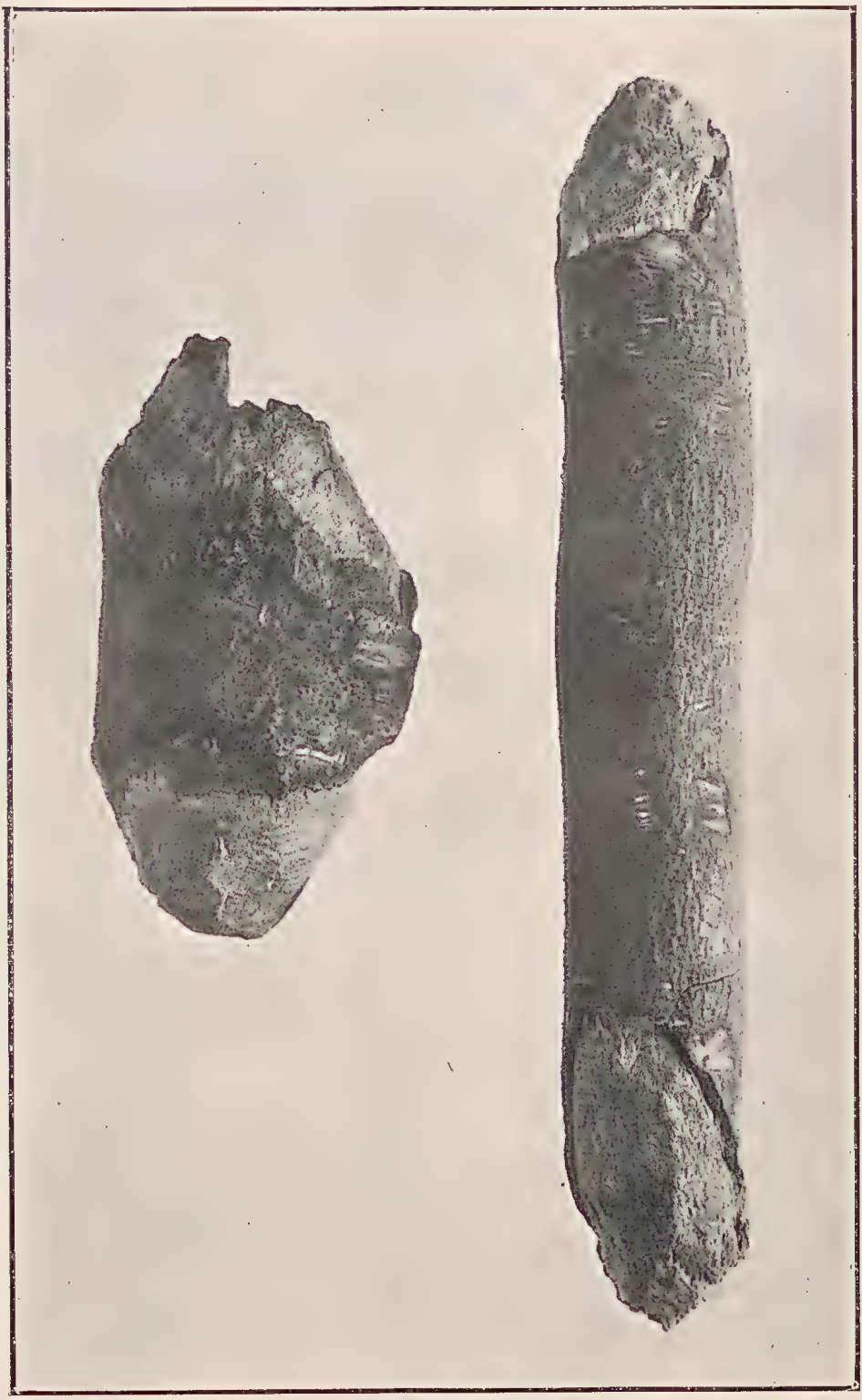


PLATE 4.—ROOTS GNAWED BY RABBITS.

(An illustration of the extremities these animals will go to when pressed for food. Found by His Excellency the Governor during a recent tour.)

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1918.

Another very trying month for egg production has been experienced. A nice shower of rain fell about the middle of November, but it has left very little trace owing to its being followed up by hot winds, which have been prevalent throughout the month. All the single test pens have now been removed to the new site. The following group pens have also been removed:—Messrs. Trapp, Carey, Whitman, Cheswell, Davies, Shaw and Stevenson, Stephens, Oldham, Mrs. Kurth, and the Progressive Poultry Pens. The group pens must evidently appreciate their change in location for the improvement in their output and general appearance is very marked. Broodiness has hampered the results in the case of some of the pens. In some cases fully one-half the occupants of the pen have spent a part of the month in the broody coops. G. Hindes's pen takes the first place for the month's laying in the light section, and D. Fulton's in the heavy section. Unfortunately, D. Fulton's F bird, which has been laying so well all along, has gone broody. There has been very little sickness to deal with. The following are the individual records:—

Competitors.	Breed.	Nov.	Totsl.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns ...	132	1,137
*G. W. Hindes	Do.	138	1,052
*E. Chester	Do.	118	1,049
*Tom Fanning	Do.	137	992
*Geo. Prince	Do.	122	989
*C. P. Buchanan	Do.	119	989
*W. Becker	Do.	132	984
*G. H. Turner	Do.	126	984
*G. Howard	Do.	90	975
*Mrs. L. Henderson	Do.	119	960
*W. Lyell	Do.	126	952
*C. Knoblauch	Do.	93	945
*E. A. Smith	Do.	127	943
*Oakland Poultry Farm	Do.	124	938
*L. G. Innes	Do.	121	930
*R. Holmes	Do.	111	924
*Dr. E. C. Jennings	Do.	130	896
*O.K. Poultry Yards	Do.	113	894
B. Casweil	Do.	110	885
*Quinn's Post Poultry Farm	Do.	107	881
*Range Poultry Farm	Do.	124	871
J. J. Davies	Do.	119	858
*Thos. Taylor	Do.	129	851
*Mrs. A. T. Coomber	Do.	117	840
Harold Fraser	Do. ...	128	835
*Homalayan Poultry Farm	Do.	117	816

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Nov.	Total.
LIGHT BREEDS—*continued.*			
*J. M. Manson	White Leghorns	121	809
*J. Zahl	Do.	116	803
*C. Porter	Do.	88	796
Mrs. L. F. Anderson	Do.	114	775
O. W. J. Whitman	Do.	98	772
*Mrs. R. Hunter	Do.	126	766
Mrs. A. G. Kurth	Do.	119	754
*J. W. Newton	Do.	104	740
H. B. Stephens	Do.	113	727
S. Wilkinson	Do.	102	726
*T. B. Hawkins	Do.	81	724
Shaw and Stevenson	Black Leghorns	119	721
Geo. Trapp	White Leghorns	123	715
R. T. G. Carey	Do.	70	710
H. F. Britten	Do.	112	703
G. Williams	Do.	97	700
Progressive Poultry Pens	Do.	107	686
B. Chester	Do.	118	673
P. O. Oldham	Do.	113	666
W. A. Wilson	Do.	104	626
A. W. Walker	Do.	96	613
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons	113	1,015
*D. Fulton	Do.	139	908
*E. Morris	Do.	117	903
*A. E. Walters	Do.	95	896
*E. F. Dennis	Do.	79	888
*R. Burns	Do.	123	879
T. Hindley	Do.	93	871
*Mars Poultry Farm	Do.	86	843
*W. Smith	Do.	114	802
*W. H. Reilly	Chinese Langshans	93	800
A. Shanks	Black Orpingtons	102	777
*J. W. Macrae	Do.	117	776
E. M. Larsen	Do.	85	758
T. W. Lutze	Do.	103	713
*F. A. Claussen	Rhode Island Reds	82	623
W. J. Mee	Black Orpingtons	67	615
H. Puff	Rhode Island Reds	71	558
Jas. Fitzpatrick	Do.	77	539
Totals		7,126	53,739

* Indicates that the pen is engaged in single test competition.

RESULTS OF SINGLE HEN TESTS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	173	186	203	175	193	207	1,137
G. W. Hindes	211	174	162	178	170	157	1,052
E. Chester	183	173	163	191	171	168	1,049
T. Fanning	174	155	183	129	177	174	992
Geo. Prince	149	179	162	176	156	167	989

RESULTS OF SINGLE HEN TESTS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued.*							
C. P. Buchanan	148	167	167	168	177	162	989
W. Becker	168	167	145	180	149	175	984
G. H. Turner	110	140	180	177	207	170	984
Geo. Howard	155	159	168	176	156	161	975
Mrs. L. Henderson	172	138	163	127	181	179	960
W. Lyell	163	171	169	151	148	150	952
C. Knoblauch	166	149	175	150	141	164	945
E. A. Smith	135	180	162	167	162	137	943
Oakland Poultry Farm	140	154	171	170	156	147	938
L. G. Innes	166	179	199	103	117	166	930
R. Holmes	168	170	145	150	136	155	924
Dr. E. C. Jennings	135	183	160	138	154	126	896
O.K. Poultry Yards	141	159	167	132	158	137	894
Quinn's Post Poultry Farm ...	181	133	189	119	175	134	881
Range Poultry Farm	70	184	128	161	159	169	871
Thos. Taylor	115	157	145	130	150	154	851
Mrs. A. T. Coomber	130	159	139	147	107	158	840
Homalayan Poultry Farm ...	166	141	122	113	149	125	816
J. M. Manson	169	151	168	107	97	117	809
J. Zahl	169	130	155	149	120	80	803
C. Porter	112	133	149	137	110	155	796
Mrs. R. Hunter	122	150	74	126	146	148	766
J. W. Newton	141	169	81	104	136	109	740
T. B. Hawkins	147	108	140	112	102	115	724
HEAVY BREEDS.							
Nobby Poultry Farm	193	173	156	113	186	194	1,015
D. Fulton	178	145	145	139	104	197	908
E. Morris	135	137	168	177	160	126	903
A. E. Walters	129	169	120	173	169	136	896
E. F. Dennis	174	140	137	89	188	160	888
R. Burns	132	149	124	134	188	152	879
Mars Poultry Farm	148	159	130	145	130	131	843
W. Smith	192	143	76	132	114	145	802
W. H. Reilly	135	161	137	92	118	157	800
J. W. Macrae	97	107	153	119	148	152	776
F. A. Claussen	111	108	94	115	116	79	623

LATE-HATCHED CHICKS.

By J. BEARD, Poultry Instructor.

Now that the hot weather is with us, the late-hatched chicks require a lot of extra attention and care, and if not attended to, the mortality will be very great. It is the late-hatched chicks, through lack of attention, that are the cause of many diseases that occur in the poultry yard by feeding too much animal and over-heating foods and allowing their drinking water to be exposed to the sun and become hot and stagnant.

Breeders who have taken my advice not to hatch any chicks after September will now be reaping the benefit, and some of their earliest-hatched pullets should now be shelling out. Compare them with the ones hatched in October, November, and December, if the owners are successful in rearing 50 per cent. of their hatches. When will they commence to lay? In March, April, May, June, and July, when eggs begin to drop in price. This is the kind of management that is the cause of

many failures in poultry farming, which should be worked on the same basis as any other branch of farming, *i.e.*, that the first crop is always the most profitable, requiring the least labour and expense in producing. When the poultry farmer commences to realise this, then he has something to look forward to and admire when he realises that the early hatched chicks are the ones that give the best returns, not alone from a laying point of view, but also with respect to the high prices he secures for his surplus cockerels in the market when he gets in early, not having to wait until the market is glutted and the returns are below normal.

With further reference to the drinking water: As I have previously mentioned, in many cases this is the sole cause of many troubles with poultry. Probably more diseases are spread through drinking water than in any other way. Impure water should not be allowed within reach of fowls. It is no uncommon sight on poultry farms, otherwise well kept, to find the vessels in a filthy condition or exposed to the sun's rays. To put clean water in dirty receptacles is a waste of time, yet I often see on poultry farms and in back yards dirty or unclean vessels containing green-scummed water. Carelessness of this kind is almost certain to result in heavy losses. The drinking water should be the best obtainable, such as we would be willing to drink ourselves, since it plays a most important part in the make-up of the fowl, and of the egg. I prefer the tap or creek water to the tank rain water, as the former is mineralised and the latter is not. Water tins should be cut so that they can be easily cleaned every day; and every week they should be cleaned and scalded or rinsed with some good disinfectant. I would also advise that a tonic be given twice a week, in the way of Douglas's Mixture, more particularly during moulting season. This can be made as follows:—Pour half a gallon of boiling water on to half a pound of copperas (sulphate of iron). When cold, add one ounce of sulphuric acid and stir well. When cold, the mixture can be put into bottles. Add one tablespoonful of the mixture to each quart of water as directed above. Care should, however, be taken not to put it in tin or iron vessels. Use earthenware or enamelled. I would also advise that one tablespoonful of kerosene once a week be added to half a kerosene tin of drinking water, this not only acts as a preventive, but is also a cure for many contagious and intestinal diseases. For roup or gapes it has no equal as a preventive.

Late-hatched chickens, at this time of the year, are susceptible to chicken-pox. The disease is both contagious and infectious. If proper attention be given in regard to cleanliness and feeding, this disease can be checked or avoided altogether. Maize in any shape or form should not be fed to young chickens, as this mode of feeding causes the birds' temperature to rise, and chicken-pox is sure to follow. The method advised during the hot weather is to feed a mash of bran and pollard mixed with either cold water or milk, and scalded wheat alternately, the latter to be given when cold. Every third day add one tablespoonful of sulphur to the mash in sufficient quantity to feed forty adult fowls; this to be given on a warm day. In adding the sulphur, the best plan is to put the sulphur into a bowl and crush to a fine powder. Then add a couple of handfuls of pollard, and mix thoroughly and add to the bulk. By adopting these means, the sulphur is evenly distributed and not left lumpy, and every bird gets its equal share. Epsom salts should be given once a week in their mash, but not on the same day as the sulphur is given. Dissolve one packet in the water you mix the mash with. One packet is sufficient for twelve adult fowls. Dry, flaked bran in tins or hoppers should always be available for the chickens to pick from, together with a good supply of grit, or charcoal, and green food when procurable.

For outward treatment of chicken-pox, bathe the head once a day with a weak solution of boracic acid, and smear the affected parts with a mixture of sulphur and zinc ointment. Ordinary washing blue made into a paste has a very gratifying effect on mild cases.

Enteritis.—This is a very common disease among poultry, and is caused by uncleanliness, foul drinking water, putrid meat food, and filthy or rotten food of any kind, the presence of unslaked lime, or continual diarrhœa. This disease is contagious, and it spreads rapidly through the flock and is responsible for many deaths. In diagnosing this disease, the bird will appear listless, the comb will be dark in colour, and the shanks shrivel up, and the evacuations are of a bilious character.

Treatment:—Quarantine all affected birds and give each one two teaspoonfuls of castor oil; two hours afterwards give ten drops of chlorodyne, and should the excreta not harden in from six to eight hours, give another five drops of chlorodyne. Feed on boiled rice and give scalded milk to drink. Clean and disinfect thoroughly all houses and yards, and burn all dead birds and accumulated rubbish. Keep a sharp look out for any other birds that may become affected. This can best be done by going to the roosts a couple of hours after roosting-time and examining the droppings and removing any affected birds, which should be treated as directed.

Tropical Industries.

THE SUGAR SEASON, 1918.

From the annual report of the General Superintendent of Sugar Experiment Stations in Queensland to the end of October, 1918, we take the following notes on the results of the crop for that year:—

1.—The anticipations in last year's report that Queensland would manufacture some 346,000 tons of sugar were not realised. This was due to three causes:—

(*a*) Mills being delayed for want of lime and bags due to industrial strife in the Southern States;

(*b*) To an early and abnormal wet season in many districts preventing an extension of the crushing into February; and

(*c*) The cyclone at Mackay.

The tremendous crop of last year was due to several causes, the chief being the large amount of standover cane from 1916 and the extremely favourable growing weather of 1917. Although the full tonnage was not secured, the 1917 crop was easily the best that Queensland has yet seen, the total amount of raw sugar manufactured being 307,714 tons or 64,877 tons in excess of the last record year—viz., 1913. In reality some 313,000 tons of raw sugar were made, but approximately 6,000 tons were destroyed in the January cyclone at Mackay and the floods which accompanied that disaster. But for shipping delays last year, the whole of the sugar would have been removed and this great loss would not have occurred. It should remain an object lesson on the advantages of the rapid getting away of sugar stocks before the wet season sets in. Fortunately, this year no stocks have so far accumulated. It is seldom that a good season is experienced in all the sugar districts at the same time, but this happened both in 1913 and 1917. Practically every mill was supplied to its utmost capacity or over-supplied.

The yield of Queensland sugar in 1917 taken with that produced in New South Wales exceeded the consumption by about 60,000 tons. This amount is held in stock by the Federal Government, the purchasers of the sugar; and every pound of it will probably be needed to make up the deficiency that will occur in this year's crops.

2.—APPROXIMATE ESTIMATE OF THE 1918 CANE CROP.

At the commencement of the present year the outlook for another large yield of sugar was highly promising, and it was generally anticipated that, if not a record, the year would approach its predecessor very closely. The severity of the cyclones at Mackay, Babinda, and Innisfail, floods in these and other districts, severe frosts from Mackay southward, and an entire absence of favourable growing weather have operated to so large an extent that the estimated surplus will now result in a shortage. At Mackay the cane suffered quite as much from the terrific rainfall in January and February as from the cyclone itself, the fall for six weeks amounting to 91 inches, the greater part of which fell during the cyclone week. Portions of this district have also been more or less severely affected by frost. At Babinda and Innisfail the cane was much farther forward at the time of the cyclone in March than it was in the January cyclone at Mackay, and suffered a great deal more damage from the actual wind. The cane on the Herbert River and Proserpine did not suffer nearly so much from the cyclonic blows, but rain and floods interfered a great deal with its growth. At Cairns and Mossman the want of suitable canegrowing weather has largely reduced the crops, the climatic conditions having been too cool. On the Lower Burdekin there was an immense crop in the early part of the year, a large proportion of which was standover, but owing to long-continued dry weather a great part of this died. It was at one time doubtful if all the cane in the district could be crushed this year, but it is generally anticipated now that the whole of it can be treated. At Bundaberg and Childers the crops are better than elsewhere, but the severe frosts experienced at the former place have also led to a reduction in the sugar yield at that place.

The following are the estimates of the amount of cane to be crushed as supplied by the various mills during the present month; they are, of course, only approximate at this stage. A rough approximate estimate made in March is also furnished to show the falling-off:—

Mill.	Rough Approximate Estimate made in March.	Approximate Estimate in October, furnished by the Mills.	Remarks.
	Tons.	Tons.	
Mossman	62,000	54,000	
Babinda	95,000	112,000	
Hambledon	85,000	70,000	
Mulgrave	70,000	58,000	
South Johnstone ..	50,000	55,000	
Goondi	60,000	50,000	
Mourilyan	35,000	40,000	
Victoria	100,000	85,000	
Macknade	100,000	80,000	
Kalamia	150,000	96,000	
Pioneer	140,000	110,000	
Inkerman	160,000	130,000	
Proserpine	63,000	58,000	Part from the Lower Burdekin.
Plane Creek	38,000	35,000	
Homebush	40,000	34,000	
Cattle Creek	35,000	30,000	
North Eton	30,000	24,000	
Marian	65,000	35,000	
Farleigh	35,000	25,000	
Racecourse	35,000	24,000	
Palms	19,000	..	Cane sent to Pleystowe.
Pleystowe	53,000	45,000	Including Palms cane.
Baffle Creek	7,000	7,000	
Miara	2,000	..	Closed down.
Waterloo	5,000	2,680	
Qunaba	55,000	50,000	
Millaquin	80,000	65,000	
Bingera	75,000	55,000	
Fairymead	90,000	84,000	
Gin Gin	26,000	24,000	
Invicta	20,000	13,100	Loss by frost estimated at 7,000 tons.
Doolbi	35,000	25,000	
Isis Central	45,000	48,000	
Childers	90,000	107,000	
Maryborough	20,000	13,000	
Mount Bauple ..	32,000	26,500	
Moreton	25,000	16,000	
Logan and Nerang ..	20,000	15,000	
Totals	2,147,000	1,801,280	

The above figures are approximate only. Taking the tons of cane at 1,801,280, and assuming that the average tons of cane required to make 1 ton of sugar will be 8¾, then a yield in the region of 206,000 tons of sugar should be realised, providing matters run smoothly till the end of the crushing season. This will be about 101,000 tons less than last year. The price of raw sugar remains at £21 per ton, so the value to Queensland should be £4,326,000. Taking the output of New South Wales and Victoria (beet) at 20,000 tons, this would give the yield of Australian sugar at 226,000 tons. This is in terms of raw sugar. The approximate shortage would be somewhere about 57,000 tons, taking the consumption as given recently by the Commonwealth as 283,000 tons. This figure is largely in excess of the last two years and evidently accounted for by the large export of sugar in jam.

NOTE.—Since the above estimate was in type some of the Mackay mills have closed for the season with a still smaller tonnage than they anticipated, so it is probable that the yield of sugar will be even less than 206,000 tons.

THE SUGAR INDUSTRY IN THE PROSERPINE AND BUNDABERG DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"Throughout the month the districts of Proserpine and Bundaberg have been visited, the latter place including the sub-districts of Woongarra, Barolin, Bucca, Sharon, Gooburrum, South Kolan, Avondale, and Invicta.

"In my last report I mentioned having dealt with a portion of Proserpine. There is a good deal of uniformity about this district, and, generally speaking, remarks that apply to one farm apply to the whole.

"The weather has been very dry, though an occasional thunderstorm has occurred within the last four months; previous to this period, however, heavy floods had been experienced.

"The soil about Proserpine is heavy and dark, with fair quantities of humus and acidity fairly pronounced.

"Some farmers at Proserpine are using tractors with satisfactory results. There is a tendency to overload these machines, however, by compelling them to drag more discs than they are rated for. The average soil resistance would be about 25 lb. throughout the district.

"The rat pest is the worst the farmers have to contend with in the Proserpine, though up to the present these have not given much trouble.

"In planting in this district I notice the farmers usually place their rows about 5 feet apart and their plants about 8 inches deep. In some cases the grower places about 2 inches of covering on his plants and others more, according to their individual opinion. In soil such as prevails at Proserpine it is not a good practice, however, to cover too heavily.

"It is a general practice here to burn the trash prior to cutting. The cutters have done their work in these fields fairly well, very little cane being left on the ground.

"It would be to the advantage in this district generally if the farmers did more subsoiling than they are doing. Most of the growers do excellent cultivation, but in many cases they do not go deep enough.

The types of plough in use principally are the ordinary discs. Weeds are kept down between plants by scuffling. It is noticeable that most of the successful farmers go well down when ratooning.

"The growers in the Proserpine district are not troubled much with noxious weeds, the worst being the Burdekin grass. Nut grass is evident in small quantities.

"In the Bundaberg district the canegrowing prospects are fair for next cutting. The soil, principally a red volcanic, is fairly free from weeds and acidity, the latter not being so pronounced as in the northern areas.

"Farmers have been going in a great deal lately for lime and green manures. This is gratifying, because the land wants lime especially.

"The weather has been very dry around Bundaberg until the last few weeks, when several bursts of rain fell.

"The principal varieties growing are D 1135, 1900 Seedling, Badila, and Clark Seeding. The firstmentioned, however, is still the most extensively grown. There are some farm areas, however, where D 1135 could be replaced to advantage by other canes, preferably Badila. This cane does well on the Hummock Plantation, where a 60-ton crop was a fine illustration of what can be grown on land carefully worked and cropped. Quantities of lime (about 30 cwt. to the acre) and green manure (Mauritius Bean) were used, with the above results.

"In planting in the Bundaberg districts the farmers mostly use the cane planter. The rows are about 5 feet apart, the plants about 8 inches deep, and 12 inches between

plants. Planters usually place their plants on a hard bottom and cover lightly with a farm implement. Farmers do not change their plants much in these cane areas.

"Fertilisers are not being used to any great extent, as results, so far, have not justified the expenditure in time and labour.

"Practically all drainage is done on the Bundaberg district farms by surface drains. There is no irrigation.

"The ploughs in common use here are the discs. Horses are mostly used, one or two planters only having mechanical traction.

"Most of the cultivators used here are fitted with hoes. These appear to be the best for the soil conditions. Ploughing is not done extensively between the rows. It was not noticeable that much damage had been done to the roots of the plants through cultivation.

"It is difficult to arrive at an average cost of cultivation, as so many of the farmers' estimates vary.

"Farmers usually burn their trash before cutting. In one or two instances have farmers volunteered ratoons, but not with satisfactory results.

"Labour conditions are fair throughout the Bundaberg district. Most of the work is done by local men. Whenever this class of labour is available there is seldom much trouble.

"Matters are unsatisfactory for the farmers at Bucca and Invicta, they having no milling accommodation closer than Bingera. Many of the growers are thinking of leaving the industry and going in for other sorts of farming."

TO REPAIR A LEAKY GALVANISED IRON TANK WITH A CAPACITY OF 10,000 GALLONS OR THEREABOUTS.

Mr. Arthur Morry, Surveyor, Department of Agriculture and Stock, advises:—

Carefully clean out the inside of the tank by removing all grease, dirt, and corroded incrustations; but this must be done carefully or the holes will be enlarged.

In a tank of this size, both inside and outside should be cemented, especially if the holes are numerous. It is not then necessary to stop the holes with any special stopping, as the cement compo when laid on will pass through the holes on to the outside and will form a much better key than if they had been stopped.

Commence with the inside, and after cleaning as above described, give the sheets a coating of cement-wash (pure cement and water), about the thickness of cream, starting at the top and working down about 3 ft. at a time. Then, before this is quite dry, fill in all the corrugations with a compo consisting of one part cement to one-and-a-half parts of clean, sharp sand. Proceed in this way to the bottom, then, as soon as possible, begin again at the top and lay on a coat three-quarters of an inch thick of one cement and one and a-half sand, and finish off with a wood or steel float.

Cover the bottom of the tank with wire netting about 1-inch mesh, and before finishing the sides turn up some strips of netting at intervals against the sides and cover them with cement. Then cover the whole of the bottom with three-quarters of an inch of compo as before, and well work it with a wood or steel float. Run a fillet about 1½ inch wide all round at the intersection of the side and bottom.

To make a thorough job of a tank of this size, the outside should then be treated in the same way, which will make the walls of the tank about 2¼ inches thick and very durable. Thirty-two bags of cement and about three yards of sand will be required to do both sides and bottom. Nineteen bags of cement and two yards of sand for inside and bottom only.

To line a 1,000-gallon tank as above, one side only, two casks or six bags will be required with half a load of sand.

Science.

REPORT ON INVESTIGATIONS IN REGARD TO THE SPREAD OF PRICKLY-PEAR BY THE SCRUB TURKEY.

By G. B. BROOKES, Instructor in Agriculture, Rockhampton.

The Scrub Turkey having been suspected by several observant settlers in pear-infested country of being the medium for carrying and distributing the seed of the prickly-pear, Mr. G. B. Brookes, Agricultural Instructor for the Central District, was deputed by the Department of Agriculture to fully investigate the matter, and report the results. Mr. Brookes has now furnished the following report on the subject:—

Although particulars have already been supplied covering a period dating from the inception of the inquiry, my remarks will, in this instance, embrace the whole of the work carried out.

The following are the principal points included in the scope of the inquiry:—

1. Are the turkeys large consumers of pear fruit?
2. Are the seeds wholly digested by the birds?
3. What proportion of the seeds taken respectively from the crop, gizzard, and intestines, and those passed by the birds, germinate in comparison to those secured from the ripe pear fruit?

The findings arrived at are:—

1. ARE THE TURKEYS LARGE CONSUMERS OF PEAR FRUIT.

The appearance of the birds received by the restaurants in town suggest that they feed largely on pear fruit, as evidenced by the purple stains on the head and feet. It may be of interest to mention that their method of securing the fruit is to fly over the plants, seizing the fruit in their claws while on the wing, then dropping it in a heap some yards distant. Quite a number of those collections were to be seen around scattered pear clumps.

To obtain definite proof that the turkey consumed large quantities of pear fruit, six birds were shot in a pear-infested scrub lying between Stanwell and Westwood. Those birds were carefully opened, the quantity of seed secured from the respective birds being as follows:—

QUANTITY OF SEED SECURED FROM SIX TURKEYS.

Turkey No.	1.	2.	3.	4.	5.	6.	Totals.
Crop	147	101	315	245	0	190	998
Gizzard	180	180	170	35	160	240	965
Intestines	67	0	126	0	70	0	263
Totals	394	281	611	280	230	430	2,226

2. ARE THE SEEDS WHOLLY DIGESTED BY THE TURKEY.

In a previous report prominence was given to this most important point, so that, when visiting scrub areas infested with pear and where turkeys were numerous, close search was made around their feeding places, and also adjacent to nests, to ascertain whether the birds rejected the seeds in their droppings. Regarding this matter, I may mention that I interviewed several farmers who were emphatic in their assertion that the turkey was guilty of spreading the pear, but their only proof was the fact that the birds consumed the fruit and that the pear was spreading in the scrubs.

An excellent opportunity was, however, afforded of securing reliable data on this point from the fact that a turkey was to be found in captivity in the Rockhampton Botanic Gardens. Mr. Simmonds, the curator, very kindly arranged to supply this bird with ripe pear fruit and note results. Although two sugar-bags of fruit were consumed, no seeds were to be found in the droppings or on the surface of the soil in the small enclosure.

The fact that seed was to be found in the intestines of three of the birds examined is undoubtedly suspicious, but as those were in every instance in close proximity to the gizzard, it is very probable that they were ejected by that powerful organ when the bird was shot.

The following extracts from communications received by Mr. P. V. Maloney, Secretary, Native Birds Protection Society, Rockhampton, bearing on this point, are of interest, viz.:—

From Mr. H. C. Macarthney, Gogango: "I have taken pains to thoroughly examine those birds shot in the district and find that they are at present largely feeding on the fruit of the pear. On opening them up I found the crop and gizzard full of pear seeds, but apparently nothing passes the powerful crushing gizzard, as all matter in the intestines was reduced to a paste."

From Mr. P. F. Macdonald, The Range, Rockhampton: "I have during the past sixty years, while I lived at Yaamba, continued to rear and make pets of these valuable birds (turkeys), and carefully watched the result, and always found them quite harmless of the charges attributed to them (spreading pear)."

3. GERMINATION TESTS CARRIED OUT WITH PEAR SEED.

Tests were made with those obtained from the crop, gizzard, and intestines of the six birds, as well as from seeds obtained from ripe pear fruit. Seeds that had passed through the turkey were not to be found. Each lot of seeds was kept separate in the tests. The results have been tabulated, however, according to the respective organs.

Two methods of testing were adopted—viz., blotting paper "tray tester," and under ordinary soil conditions. Ten seeds were taken from each lot for the "tray tester," the balance being planted in a plot of land shaded by the branches of an adjacent tree, and protected from vermin by bird netting. No rain having fallen since the commencement of the test, frequent waterings had to be resorted to, the soil being kept moderately moist.

For comparison, a test was carried out in both tester and soil with seed obtained from ripe pear fruit. This was of interest as it is generally believed that pear seeds will not germinate for years unless they have passed through the digestive tract of an animal or bird.

RESULTS OF GERMINATION TESTS.

Commenced 22nd July, 1918, to date 20th November, 1918.

Percentage Germinating.		Sept.	Oct.	Nov.	Total.	Grand Total.
Crop	Tester	2	24·0	·4	30·0	Crop .. 14.5
	Soil	..	·9	4·7	13·7	
Gizzard	Tester	..	1·6	3·4	5·0	Gizzard .. 6·7
	Soil	..	5·9	1·0	6·9	
Intestine	Tester	..	..	..	..	Intestine 0·7
	Soil	..	0·8	..	0·8	
Check— (Pear Fruit)	Tester	..	85·0	5·0	90·0	Check .. 62·5
	Soil	..	46·0	10·5	0·56	

Attached herewith is a photograph of the tray tests taken on the 29th of October.

It was noted that a large proportion of the seeds obtained from the gizzards and intestines were considerably worn down, many being chipped and broken. To this fact may be attributed the low germination so far recorded of the seeds taken from those organs.

DEDUCTIONS ARRIVED AT.

It will be noted from the investigations carried out that the scrub turkey is not, as alleged, an active agent in spreading prickly-pear. However, should evidence be forthcoming to the contrary, it will be carefully inquired into.

In regard to the germination tests, unless advised to the contrary, those will be discontinued at the end of the present month.

GENERAL OBSERVATIONS.

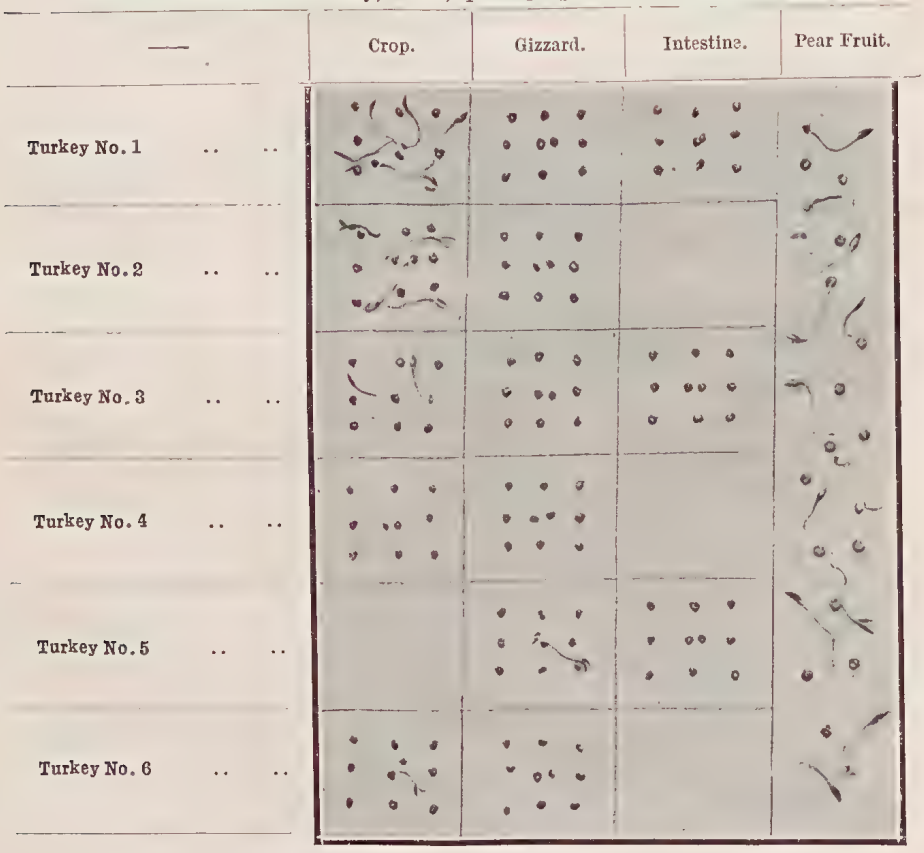
In carrying out the soil tests, it was noted that when the plants were about an inch high the leaves were eaten off, by what agency I was unable to ascertain.

It was also noted that the young seedlings are very delicate. Exposure to sun and high temperature shortly after germination will cause them to shrivel up close to the soil and fall over, the leaves remaining green for some time after.

When the enormous crop of pear fruit that is produced annually is taken into consideration, the fact that the seed germinates readily is of interest. Much of this seed is transported over considerable stretches of country by floods and heavy rains. Fortunately, a very large proportion of the resultant plants must perish shortly after germination, the factors abovementioned contributing largely to this end.

GERMINATION TESTS WITH PRICKLY-PEAR SEEDS FROM SCRUB TURKEYS AND RIPE PEAR FRUIT.

Test commenced 11th July, 1918; photographed 29th October, 1918.



Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report on Cane Grub Investigation, by Dr. J. F. Illingworth, Entomologist to the Bureau:—

"The extended drought is having a serious effect upon the cane in the Cairns District. Most of the late planting is barely holding its own, while cane planted early in the season is showing serious drying of the lower leaves.

"In some cases, where the fields were all prepared, planting has been so long delayed by the dry weather that they will not be put in this season. This has a rather serious aspect with regard to our investigation, for I was anxious to get the results from a number of these late-planted areas. However, we may be able to get results from what is already in, if the weather becomes favourable for growth and continued cultivation.

"CULTIVATION AS A CONTROL MEASURE FOR GRUBS.

"As has been demonstrated, cultivation during the period that the beetles are active seriously interferes with the laying of their eggs. Hence the value of the late planting, which permits thorough cultivation right through their ovipositing period.

"Let me urge, then, that the cultivators be kept active in every infested field, wherever it is possible to get through the cane. It is important to do this work even though the ground is clean; and it should begin not later than two weeks after the first beetles emerge. It will be well to go over the ground at least every two weeks as long as the beetles are in evidence.

"As indicated in my previous report, it may be profitable to start the preparation of the land which is to be planted early (April-May). The ploughing, harrowing, and so forth, will undoubtedly have a deterrent effect upon egg-laying in these new fields. They do not like freshly-ploughed ground, especially if it is devoid of grass and trash. Definite observations by growers on these points will be appreciated, for they may save us a lot of detailed experiment.

"EXCHANGE OF PARASITES.

"Since the breeding of our parasitic wasps belonging to the genus *Campsomeris* was so successful under artificial conditions, it has occurred to me that these insects might be very valuable if liberated in countries where they were free from their natural enemies. These foes are so abundant here that the wasps are scarcely able to make themselves felt in the open, though they breed very prolifically. Vast numbers of their young are destroyed by secondary parasites, and the adults that do escape probably often fall a prey to the numerous fly-catchers which are present here.

"Since Australia is the native home of numerous beetles of the family *Scarabœidæ*, with great range in size, this is a fertile field for the development of parasites; but, unfortunately for our own interests, this parasitism has advanced to the hyperparasitic stage, *i.e.*, the parasites are themselves attacked by other parasites. It is a well-recognised fact, however, that insects introduced into new countries where they are freed from their natural enemies, for a time multiply by leaps and bounds if the climate is suitable for them.

"White grubs are becoming increasingly important in sugar-growing countries, and it behoves us to work together for their control.

"Our experience with these wasps has been that they are not limited to any particular species of grub, for they are apparently able to adapt themselves to a

considerable range in size. Then, too, transportation to foreign countries will be rather simple, since the wasps have a rather extended pupation period.

"We are hoping that we may get some relief by the introduction of parasites —at any rate, it is worth making the attempt. We are in correspondence with various sugar-growing countries with this end in view. We certainly stand ready to reciprocate if our wasps are needed elsewhere.

"EMERGENCE OF BEETLES, 1918.

"The long drought has delayed this emergence in many districts, so that it is possible that many will not come out at all. Sections favoured by the rains last month got a crop of beetles at once. About 2 inches fell around Babinda on the night of 15th October, and the next day the greybacks were out in force. On the 19th, at dusk, I found the feeding-trees swarming with beetles; one scrub had nothing but green beetles, *Callodea punctulatus;* others had all three species of *Lepidiota—albohirta, caudata,* and *froggatti,* in almost this order of abundance. There were cane lands alongside, and the shrubs were in a grass field.

"NOTES ON *LEPIDIOTA FRENCHI.*

"Changes take place in the grubs of this species during October. Both second and third stage grubs are in cells during the cool weather; but as the hot days come on the second-stage grubs moult, changing to the third stage, and begin their destructive feeding. At the same time, the third stage pupate. Hence it is seen that this species spends a full year in the third larval stage. It is shortly after the beginning of this stage that the insects do their worst damage to sugar-cane, as indicated in our reports published in the 'Sugar Journal' for December, 1917, and January, 1918.

"Fortunately, this species only troubles new land, for the beetles do not favour the laying of their eggs in old fields, preferring blady grass."

ANOTHER IMPORTED PEST.

The ravages of the lucerne seed chalcid wasp in the Pallamawalla district have been investigated by Mr. W. W. Froggatt, Government Entomologist, and in his report to the Minister for Agriculture he makes recommendations for combating the pest.

Mr. Froggatt says that this chalcid wasp was originally a native of the United States, and was introduced into New South Wales with imported lucerne seed. It has for some years past greatly reduced the yield of lucerne seed in the Tamworth district. It was first noticed in Pallamawalla about three years ago, and for the last two years has increased very rapidly and has done a great deal of damage. The tiny black wasp punctures the immature seed, and deposits her eggs beneath the skin, under the protection of which the baby larval wasp feeds, grows, and finally pupates. The perfect wasp emerges from the pupa by cutting a hole through the skin of the lucerne seed.

At the time of the Entomologist's visit no wasps could be found about the lucerne flowers, but any waste seed in the thresher or sheds contained a percentage of parasitised seeds in the pupal form, from which the perfect parasites were at any time ready to emerge.

Experiments carried out by the lucerne growers have shown, says Mr. Froggatt, that if the first summer cut is burnt, the next cut can be allowed to ripen for seed. His advice is that if the first cut is made before the seed is more than half-grown, and allowed to dry for lucerne hay, it will not be necessary to burn it, as the immature wasp larvæ will die as the seed withers in haymaking.

Animal Pathology.

REPORT ON MR. MUNRO HULL'S CLAIMS REGARDING TICK-RESISTING CATTLE.

By Dr. T. Harvey Johnston and Miss M. J. Bancroft, B.Sc., Biology Department, University, Brisbane.

In the September, 1912, number of this journal, Mr. G. W. Munro Hull, of Eumundi, North Coast line, called attention to the existence of a tick-resisting condition in a certain number of the cows forming his dairy herd, such animals remaining free from tick infestation whilst the remainder were regularly attacked. He believed that this peculiarity was caused by the presence in such animals of some tick destroying microbe, and that it was possible to convey the resistant quality to other animals by vaccination of the latter with some of the "lymph" occurring chiefly on the escutcheon of resistant animals. It was stated that such cows did not require to be sprayed or dipped since they remained sleek and clean-coated whilst the untreated stock suffered from tick attacks. The vaccinated animals were liable to invasion by tick larvæ, but the latter nearly always died soon afterwards. Only on rare occasions did any reach maturity and lay eggs, but such eggs had not been found to hatch. Even when such animals were turned out into open country for months at a time they maintained their resistance, whilst ordinary cattle under the same conditions became heavily infested, some dying of tick worry, even though food was abundant. Mr. Hull also suspected that the resistant condition was hereditarily transmitted.

The Agricultural Department purchased two cows, "Clover" and "Tinkerbell" (specially selected by Mr. Hull as examples of his resistant stock), in order to test the correctness of these claims. Since the latter were more specifically stated by him at a later date, we might briefly summarise the list published as a parliamentary report in the latter part of 1914:—

"1. That these cattle never mature more than a few odd female ticks during the course of a year—a total of from 50 to 100 per year being the highest estimate, though the animals are regularly infested (naturally) by myriads of larvæ, the majority of which die while still very minute.

"2. That as a result of such freedom from developing ticks, these cattle do not require any attention as regards ticks, and may be turned out on any country for indefinite periods without experiencing tick worry, and consequently present a clean sleek appearance.

"3. That this peculiarity is transmissible to other cattle by 'contact' (*i.e.*, natural infection) and by vaccination, and is transmitted in every case to the progeny of such animals, but does not manifest its presence in the offspring until after the first year of life.

"4. That the material used for vaccination (*i.e.*, the exudate occurring on the escutcheon of resistant stock) is not produced as a result of excessive tick worry.

"5. That the comparatively few female ticks which are to be found maturing on such animals have become displaced without injury from other cattle and have reattached themselves to the resistant stock.

"6. That though these ticks may lay eggs, no larvæ develop from them, though eggs laid by ticks taken from control cattle readily hatch.

"7. That a few ticks are to be seen at odd times on resistant animals during winter, when other cattle are free from them.

"8. That such animals have a markedly higher temperature than other cattle during winter."

In 1914 Mr. C. J. Pound, director of the Yeerongpilly Experimental Station, as a result of his observations regarding the two cows purchased by the Government, reported adversely on Mr. Hull's claims. He stated:—

"1. That after having been placed in a ticky paddock for twenty-seven days, the two cows matured large numbers of ticks.

"2. And that they became so badly infested and tick-worried that dipping or spraying would have been justified.

"3. That he had not been able to transmit the alleged peculiarity to other cattle either by contact or by vaccination, while the calf of one of the two animals was commonly more or less heavily tick infested.

"4. That the exudation was caused by tick attacks.

"5. That cattle ticks only very rarely, and then with the greatest difficulty, reattach themselves while maturing.

"6. That there is no difference in regard to the rapidity of hatching of eggs laid by ticks taken from the two experimental cows and those laid by ticks from other cattle.

"7. That there is practically no difference between the nature of the infestation of the so-called resistant animals and that of ordinary cattle during either the winter or summer months.

"8. That the difference in temperature reported by Mr. Hull did not occur."

It will thus be seen that Mr. Pound disagrees with all Mr. Hull's claims. The latter were in part restated in 1915 before the Select Committee of the Legislative Assembly, and another claim was added—viz., that the application of an arsenical dip or wash temporarily suppressed the tick-resisting peculiarity.

Mr. Hull has recently modified (in a letter), as a result of further observations, certain of his claims (Nos. 1 and 3 in this report) to a slight extent, and now states that the number of ticks (50-100) given as being carried per year by a resistant animal, is in many cases excessive; that some of the ticks, in addition to the few that mature, instead of dying whilst very minute, as most of them do, continued to develop but die before undergoing engorgement; that certain cases of apparently hereditary transmission are really due to contact; and that in one case the exudate made its appearance in a calf during the first year of life.

It appears to us that the most important points to be ascertained are—

1. Whether tick-resistance actually occurs—*i.e.*, whether there are cattle which, when placed under conditions of natural infestation, do not become infested to the same degree as other animals similarly situated.

2. Whether the degree of resistance is sufficiently marked so that very few, if any, ticks mature on such animals which, as a consequence, do not require dipping or other treatment to prevent tick worry.

3. Whether resistance depends on breed, food, climate, &c.

4. Whether the resistant condition (if present) can be transmitted in any way.

5. Whether an exudation of serum or lymph occurs locally on resistant animals; and whether such is merely a form of tick sore.

Tick resistance might be manifested by—

(*a*) A failure to develop any ticks belonging to a particular species; such would be an example of tick immunity.

(*b*) A tendency towards light infestation when ordinary controls become heavily infested.

(*c*) A failure on the part of female ticks to become fully matured or engorged in such numbers as on controls when under the same conditions of climate.

(*d*) A failure of such engorged ticks either to lay a normal number of eggs or to lay eggs showing a normal percentage of hatchings.

In regard to (*a*), we know that some ticks are very restricted in regard to suitable hosts, *e.g.*, the cattle tick (*Boophilus australis* and related species and varieties) thrives on cattle and occurs naturally on horses and occasionally on sheep and certain other animals, but it is essentially a parasite of cattle. Other species are not so restricted—*e.g.*, various species of *Ixodes*, including our coastal scrub tick *I. holocyclus*. Some must leave their host to undergo certain stages of development, and then must reattach themselves to some suitable host which may belong to quite a different group of animals—*e.g.*, the red-legged cattle tick (*Rhipicephalus sanguineus*) which is occasionally found on horses, cattle, and dogs in South-eastern Queensland. The cattle tick, however, passes through all its stages on the one host animal. It is common knowledge amongst graziers and dairy farmers that there exist in many herds animals which are more or less resistant to tick invasion. For some reason such beasts are distasteful to ticks, and, consequently, the larvæ either do not attach themselves or else, having become attached, they only occasionally develop to maturity.

We have interested ourselves in the question of tick resistance of cattle, and have endeavoured to collect all the information that we could regarding the condition. With this end in view we have visited a number of farms where resistant stock were to be found and have given special attention to the animals which at present form, or previously formed part of, Mr. Hull's herd. We have inspected them on many occasions during 1915-1918, while during the present year (1918) one of us accepted the offer of hospitality from Mr. and Mrs. Hull in order to make a detailed study of the cattle for a prolonged period (January-February, March and June), when all the engorged ticks to be seen on resistant animals were carefully collected, most of the cattle being examined both morning and afternoon, whilst the non-milkers were usually inspected once daily.

The following is the result of our thorough collecting from a number of resistant cows during a period of twenty-seven consecutive days in the height of the tick season (January and February, 1918) :—Cow No. 1, nil; No. 2, 3; No. 4, 3; No. 5, 2; No. 6, 0; No. 7, 4; No. 8, 13; No. 9, 0; No. 10, 30; No. 11, 16; No. 12, 0; No. 13, 1. Nine were taken from No. 14 in twelve days, and sixty-four from No. 15 in twenty-seven days. The last animal is regarded by Mr. Hull as a non-resistant cow.

Nos. 7, 9, 14, and 15 are young animals. Excluding No. 10, only thirteen fully matured ticks were removed from nine cows during the whole period, and even if we include No. 10, then the total is only 27. It may be urged that these figures only prove that ticks were extremely scarce on the property at the time, but that such was not the case was shown by the occurrence of fairly heavy infestation of a number of control heifers from another district, which were then being depastured with Mr. Hull's herd. No stronger evidence could be brought forward to prove the presence of a very marked tick resistance in these animals. Many others were carefully, but not so systematically, examined, and most of these showed the presence of resistance.

We have placed ourselves in communication, as far as possible, with those who have had any experience with Mr. Hull's stock, and have taken the opportunity to examine many of them elsewhere.

In practically all cases the animals retained their resistance even when moved to other districts, provided that they maintained fair or good condition, and, as a consequence, did not require any treatment to prevent tick worry—in other words, under conditions of natural infestation, our observations have led us to agree with Mr. Hull's contentions numbered in this report as Nos. 1, 2, and 3.

It may be urged that departmental findings in regard to the two selected cows are exactly the opposite to our own. We have, as already stated, had Mr. Hull's animals under intermittent observation for three and a-half years, and under the closest observation for a period greater than the normal parasitic period of the cattle tick. Mr. Pound's findings are no doubt correct when the animals were subjected to abnormal circumstances, *e.g.*, poverty of condition, intense artificial infestation, &c. When these same two animals were allowed their freedom under conditions which permitted only natural infestation, the published evidence associated with the names of Messrs. Corser and Walker, MM.L.A., Chambers, Bates, and Butcher has satisfied us that Mr. Hull's claims were correct in regard to these two animals also. One of them, "Clover," just before death, became heavily infested, but this is only what one might expect, as with old age comes a lowering of condition and a lessening of resistance to any disease, including tick invasion.

Those who are interested in the matter are invited to peruse a somewhat lengthy communication on "A Tick-resistant Condition in Cattle," which is being published in the "Proceedings of the Royal Society of Queensland" (1918, p. 219-). This article deals with tick worry, habituation of cattle to tick infestation, tick poison, tick resistance, conditions affecting such resistance, and the transmissibility of the peculiarity. All the evidence that we have been able to collect is there summarised.

We have carried out a series of observations with engorged ticks from resistant animals with a view to testing the fertility. We found that from the eggs laid by such ticks the percentage from which larvæ were obtained was considerably smaller than in the case of ticks from control animals. The percentage of those whose eggs did not develop into larvæ was the same in both cases, whereas the percentage of partial fertility was much greater, and of practically complete fertility was much less, than in the case of controls. In other words, not only did very few ticks mature on such animals, but there was also some impairment of the vitality as shown by the lessened number of viable eggs (Claim No. 6). We endeavoured to artificially infest a resistant animal to a moderate degree, but without success.

We disagree with Mr. Hull's opinion (Claim No. 5) that the ticks on resistant cattle have developed on other animals and reattached themselves to such resistant

animals. In regard to the few ticks which Mr. Hull states (Claim No. 7) are to be found in winter on such animals when other cattle are free, we believe the explanation to be as follows:—The cows which come under closest observation are the milkers, and as a result of being in milk, such animals during winter frequently fall into somewhat low condition, which brings about a diminution of their tick-resisting powers. On the other hand, resistant cows when dry seldom become infested.

We took the temperatures of a number of resistant animals during the summer, and found them to be approximately normal. We think that a similar result would be obtained by registering the temperatures during the winter also (Claim No. 8).

In an article published in this journal (1918, vol. 9, pp. 171-2) we called attention to the presence of tick resistance in cattle, and invited correspondence regarding the effects of breed, food, dipping, condition, &c. A number of replies were received from various districts.

Brahmin cattle and crossbreds are more or less strongly resistant. In Queensland, tick resistance is not confined to any one breed, though apparently more common amongst Jerseys and Jersey crosses, perhaps on account of the presence of fine short hair and rather oily skin. Individual animals of various other breeds, Shorthorn, Ayrshire, Holstein, Hereford and their crosses may possess a marked resistance. We are inclined to believe that it is to some extent a matter of individual idiosyncrasy. We think that food has an influence only to this extent: that animals in good condition are commonly less infested than those in poor condition. It may be urged that such animals are in good condition because they are not tick worried, but it is undoubtedly also true that an animal in good health is less liable to invasion owing to its natural resisting powers being then most marked.

Resistant animals have been noted in a number of localities, extending from the Atherton Tableland to Springbrook Plateau, more usually in the vicinity of scrub country—perhaps the more abundant fodder in such situations helping to maintain condition and resistance.

Evidence has been collected in favour of, as well as against, the view that the application of arsenical solutions suppresses resistance. We are inclined to think that, provided the condition of the animals be not lowered by the treatment, suppression or diminution of resistance does not happen.

Transmissibility of Resistance.

Mr. Hull claimed that it could be transmitted hereditarily, by vaccination, and by contact—*i.e.*, that it could be naturally acquired. Mr. Pound's observations did not uphold any of these claims.

We have carefully collected all the evidence available in regard to the herds of Messrs. M. and F. Hull (Eumundi), Mr. Inigo Jones (Crohamhurst) and others. As a result, we believe that resistance in certain cases is a quality capable of hereditary transmission. This does not mean that all the progeny of such cattle will be resistant. It is necessary to know how the parental stock acquired the peculiarity. We have not obtained sufficient information to allow us to state whether it is of a Mendelian character. It is possible that certain cattle may really be "sports" as far as resistance is concerned, and, in such cases, the quality would be transmissible to a percentage of the offspring. We would like to obtain more informtaion regarding the result of mating a resistant bull with resistant and non-resistant cows, so as to enable us to decide what part (if any) heredity plays.

There is considerable evidence in favour of the view that resistance can be transmitted to other animals by vaccination, *i.e.*, by using some of the exudate (to be referred to later) from resistant cattle. We have not succeeded in so transmitting it to any of our experimental animals.

Mr. Hull, when speaking of transmission by "contact," means to infer that the condition is picked up naturally by means of the larvæ which hatch from eggs laid by ticks from resistant cattle, conveying "something" derived from such animals to those which they infest, and thereby setting up resistance. Our experiments were unsuccessful. We also failed to find in the exuudate any organisms other than those whose presence resulted from contamination. In this we agree with Mr. Pound's findings. Moreover, there are many animals which have been on Mr. Hull's property in company with resistant animals for periods varying from one to seven years without becoming resistant.

We, however, believe that in most cases the condition is naturally acquired as a direct result of moderate, long-continued infestation, which causes the production of an anti-tick substance in the blood and other fluids of certain cattle. In other words, we believe that the tick actually injects minute quantities of a poison (tick poison), and this stimulates the blood (just as the injection of other foreign substances does)

to manufacture an anti-tick substance which neutralises the poison. We have found an anticoagulin in the cattle tick, and it is known that similar poisons occur in several other ticks, which, on injection, give rise to various symptoms, but if recovery occurs, then an immunity, or at least a resistance, follows.

We think that habituation is a step towards such resistance, and that the condition is slowly acquired as a result of tick attack. Some cattle-owners assert that if animals remain undipped for a season, then the animals will either die of tick worry or else become resistant. This is perhaps correct, but in view of the greater probability of the former event happening, we think that dipping, in conjunction with a rotation of paddocks, should be systematically carried out, in order to control the tick pest and assist in its eradication.

EXUDATE.

Associated with tick resistance there may be an exudate (Hull's Claim No. 4 in this Report) which we have already described in the pages of this Journal (May, 1918, p. 172). It consists of drops of a clear yellow fluid, which appear on the skin on various parts of the body, neck, dewlap, butt of tail, and escutcheon, notably on the lastnamed, where it is more evident owing to the shortness of the hair. These drops become thick and sticky, ultimately forming little granular masses of thin flat yellow scabs, according to the size of the original drop. The largest patches seen were about the size of a sixpence or slightly larger. In some animals these little masses of exudate are perfectly clear, the skin appearing through them quite uninflamed. In others some blood may be present, and then the resulting scab is discoloured. When dry, these scabs are readily flaked off, leaving a rounded area of smooth clean skin beneath. There is no positive evidence to prove that each patch of exudate is caused by the bite of a tick, though, occasionally, larval ticks have been found attached to a dry scab, having become entangled in the sticky fluid. This exudation of lymph must be due to one, or both, of two causes—(1) either a slight mechanical injury to the tissue which, while not usually penetrating a blood capillary, allows an escape of lymph from the tissues; such might be caused by the larval tick inserting its rostrum, and then withdrawing it and going elsewhere; (2) or to an increase in the blood pressure, involving an extravasation of lymph from the capillaries. The formation of small hard lumps on the flanks and in the vicinity of escutcheon and neck of resistant animals, upon the centre of which a patch of fresh exudate may or may not appear, would be accounted for by an increase in blood pressure, since, when scored, blood flows very freely from such lumps. The affected area is rather irritable, the cows showing a desire to lick or rub the part. This exudation makes its appearance particularly during the warmer months(October to June), especially during the moist weather.

The condition just described appears to graduate into a type of tick-sore, so far only noticed on resistant animals. The scab formed over such a tick-sore consists of two very distinct parts—an outer ring of a clear yellow substance, apparently composed of exactly the same matter as that spoken of above, surrounding a dark blood-stained core on the upper surface of which there is a pit where the mouth parts of a tick have been inserted, while very often the tick is still present. Development up to the adult stage occurs in such ticks, but the females are unable to bloat and remain stunted, sickly-looking individuals, eventually dropping off with the scab. The under-surface of this hard black core, surrounding the rostrum of the tick, often contains pus. When such a scab is removed a corresponding pit is seen in the skin of the beast.

Although we have failed to find even larval ticks in the great majority of the patches of exudate examined by us, even after using the microscope, we believe that they are a direct result of larval tick attack on certain cattle, *i.e.*, cattle which possess some individual physiological peculiarity. Such animals are resistant, and apparently the small quantity of tick toxin—perhaps even the mere mechanical stimulus caused by the insertion of the rostrum—is able to so increase the local blood pressure that there is an exudation of lymph. We have already stated our opinion that the blood of resistant animals will be found to possess certain differences in regard to its biochemical composition.

It may be objected that this exudate makes its first appearance each season before the presence of ticks is noticed, but we must point out that larvæ begin to infest cattle some little time before their occurrence is noted by an ordinary observer.

We, then, agree with Mr. Pound in regard to this claim that the condition is the result of tick attack, but we disagree with him when he regards it as an ordinary tick-sore. We agree with Mr. Hull that it is not the result of irritation caused by excessive tick worry.

Commenting upon the preceding report, Mr. C. J. Pound, Government Bacteriologist, makes the following remarks in a communication to the Under Secretary, Department of Agriculture and Stock:—

During the past six years Mr. Hull, in his numerous reports to the Department and the public Press, has been most persistent in such statements as:—

> "It is absolutely impossible for cattle ticks to live more than a couple of days, and in no case have I known a tick to develop on any of these specially treated animals."

> "If carefully watched, these ticks will in a couple of days be found to be merely dry scales which fall off, leaving no trace of their existence. It sometimes happens that a full-grown tick will adhere to one of these treated cattle, and the result is the same."

> "I can show you thousands of larval ticks swarming on these proof cattle to-day, and in a week's time show you nothing but dead pupa with an occasional half-matured female, while the ordinary cow, if left unsprayed, will in three weeks' time be heavily infested with mature ticks."

> "The cattle that have contracted this disease come into the yard smothered with tiny ticks, which duly adhere; but in a couple of days they may be scraped off as dry shells, and in no case do they ever mature as they do on other cattle."

According to the report under review, Mr. Hull has modified these claims, and now contends—". . . . . that some of the ticks, in addition to the few that mature, instead of dying while very minute, as most of them do, continue to develop, but die before undergoing engorgement . . . ."

As engorgement rarely takes place before the twentieth day, these ticks must have developed and survived the second moult on the animal.

In this connection, the fact must not be lost sight of that dead ticks in various stages of development are frequently found on ticky cattle, no matter what the degree of infestation.

The authors state that—"Under conditions of natural infestation our observations have led us to agree with Mr. Hull's contentions numbered 1, 2, and 3 in this Report."

With regard to No. 1.—The observations as conducted on the question as to the number of ticks found on cattle at Mr. Munro Hull's farm at Eumundi must be regarded as only of relative value compared with the definite and positive results obtained by Messrs. Watson and Carmody at Yeerongpilly, on which occasion the cattle were not artificially infested, the animals having been brought from a ticky paddock and placed in stalls for convenient and exact observations.

The number of ticks found on cattle running on ticky country is extremely variable and largely due to the conditions of environment. Gross tick infestation or so-called tick resistance is not by any means constant, *i.e.*, at variable periods a heavily tick-infested animal may become lightly infested, while a so-called resistant animal may become grossly infested, as demonstrated by the observations conducted at Maryborough and Yeerongpilly; hence it is obvious that at times the necessity arises to dip or spray these alleged tick-resistant cattle, which is a complete answer to No. 2.

With regard to No. 3.—No. 3 reads as follows:—"This peculiarity is transmissible to other cattle by contact (*i.e.*, by natural infection) and by vaccination, and is transmitted in every case to the progeny of such animals, but does not manifest its presence in the offspring until after the first year of life . . . ."

Hereditary Transmission.

The authors, although their investigations cover a period of three and a-half years, do not mention having actually conducted experiments in order to determine whether the alleged tick resistance is transmitted by heredity, but have collected evidence from Mr. Munro Hull, Mr. F. Hull, Mr. Inigo Jones, and others, and as a result they state:—"We believe that resistance in certain cases is a quality capable of hereditary transmission."

Transmission by Vaccination.

On the all-important question of transmission of tick resistance by vaccination, the authors state:—"There is considerable evidence in favour of the view that resistance can be transmitted to other animals by vaccination. We have not succeeded in so transmitting it to any of our experimental animals."

Further, with reference to transmission by contact, the authors again say:—"Our experiments were unsuccessful."

It is also of interest to note that they state:—"Mr. Pound's observations did not uphold any of these claims."

With reference to the development of ticks on so-called resistant cattle, the authors state that "during the months of January, February, March, and June all the engorged ticks to be seen on resistant animals were carefully collected, most of the cattle being examined both morning and afternoon, whilst the non-milkers were usually inspected once daily."

During January and February, 1918, the small total of 145 ticks were removed from fourteen cows in twenty-seven days, but no mention of the number of ticks collected during March and June, the latter being a mid-winter month, when, according to Mr. Hull, matured ticks are more numerous on the so-called resistant cattle.

As, presumably, this experiment was conducted largely with the object of determining accurately the total number of ticks that matured and became engorged on these alleged tick-resisting cattle, I am perfectly satisfied that careful examinations conducted even twice daily could not possibly reveal the total number of ticks that matured on these animals.

Observations of over twenty-five years have convinced me that in order to determine the total number of ticks maturing on any given animal such an animal must be kept in a stall under constant observation, for it is a well-known fact to those who are intimate with the life history and development of the cattle tick that at a certain stage ticks become rapidly engorged and fall off at any time during night or day. This was strikingly brought under notice during the following experiment:—

In May, 1914, "Clover" and "Tinkerbell," both in good condition, were placed in a ticky paddock (natural infestation) for twenty-seven days, then brought into stalls and kept under observation. Mr. H. B. Watson and Mr. Inspector Carmody were instructed to collect ticks as they matured. During this period of twenty-five days thirty inspections were made, and of the engorged female ticks collected 230 were picked off "Clover" and 860 from "Tinkerbell." The morning and afternoon inspections usually occupied about thirty minutes, but during the intervals a considerable number of ticks became engorged and fell off among the bedding, but such ticks were not included in the total.

In order to make the Yeerongpilly experiments more complete in some of the earlier observations, artificial infestation (by no means intense) was resorted to with a view of ascertaining if such ticks would mature and become engorged on the cows "Tinkerbell" and "Clover," but I must take exception to the author's statement that the animals ("Tinkerbell" and "Clover"), whilst at Yeerongpilly, "were subjected to abnormal circumstances, *e.g.*, poverty of condition, intense artificial infestation, &c."

These remarks are not from me, nor could such inference be drawn from any of my reports; on the contrary, the two cows, whenever in my charge during the past six years, have always been well fed and specially cared for, and not subjected to conditions likely to produce a lowered resistance. Further, in order to keep down gross tick infestation, the cows were sprayed periodically with other cattle.

It may be questioned why it is necessary to spray cattle running in paddocks at this Government institution. In reply, I may state that the various paddocks on this property lie practically in a basin surrounded on three sides by public roads and vacant land on which are running numbers of straying dairy cattle, the majority of which are, during the greater part of the year, grossly tick infested. The ticks from these cattle, with eggs and larval ticks, are washed by the storm waters into the two creeks that pass through the Station paddocks; hence the necessity for continual spraying of all the cattle on this property.

On the question of animals losing their power of alleged tick resistance through scarcity of feed, reference is made to the original cow "Clover," which, it is stated, just before death became heavily infested.

This is not borne out by Mr. Hull's report to the Department, dated 6th February, 1916, of which the following is an extract:—"Thus 'Tinkerbell' became so poor that she was so heavily infested under natural conditions that she failed to survive, whilst her companion 'Clover' (a hardy natured cow—Ayrshire) remained in condition in spite of severe weather, and at the same time held her powers of tick resistance."

In another report, dated 3rd February, 1916, Mr. Hull states that—"Owing to the severe drought, natural feed is scarce, and records show that one of the cows

('Tinkerbell') fell so low in condition that on 10th December she was heavily infested with fully matured ticks, whilst her companion (of a hardier constitution—Ayrshire) was perfectly clean and in good condition. 'Tinkerbell' was a grade Jersey. 'Tinkerbell' fell so low in condition as to succumb to an assault from another cow—a fate which befel more than one of my own cattle during the dry spell we are just recovering from.''

Winter Ticks.

Mr. Hull claims—''That during the winter months these cattle will mature more female ticks than in the summer, when ticks are most active.''

This, Mr. Hull explains, is because these so-called resistant cattle have a higher normal temperature (1-2½ per cent.) during the winter months than they have during the summer months, thus confirming his idea ''that they possessed a temperature high enough to suit the tick, while the temperature of the ordinary cow in conjunction with the air temperature was too low for them.''

He further states—''I would like stockowners to know that I had long ago advised the Department that I had observed that, although these cattle carried no ticks during the summer, when ticks were most active, they always matured an inconsiderable number during the cold weather, when the ordinary stock were free from ticks.''

And again to quote Mr. Hull—''Out of the hundreds of such ticks taken from these proof cattle during the last three years not one of the thousands of eggs they laid (under observation) has ever hatched out.''

The presence of mature ticks during the winter months on what he terms his proof cattle is explained by Mr. Hull as having been ''picked up from other cattle after passing the pupa stage.'' Although the authors disagree with Mr. Hull on this question, their findings are based on temperatures of cattle recorded during the summer months only.

The Influence of Food as a Factor on the Degree of Infestation.

The authors state that—''We think that food has an influence only to this extent—that animals in good condition are commonly less infested than those in poor condition. It may be argued that such animals are in good condition because they are not tick worried, but it is undoubtedly also true that an animal in good health is less liable to invasion owing to its natural resisting powers being then most marked.''

I entirely disagree with these views, for I have repeatedly observed that healthy, fat cattle from the Sydney and Brisbane shows are readily susceptible to tick invasion; moreover, they are not borne out by the years of experience of those who have closely observed good, healthy cattle on station properties and the constant arrival of healthy, tick-infested, fat cattle at our Northern meatworks.

Exudate.

Under this heading, the authors state that ''the condition appears to graduate into a type of tick-sore, so far only noticed on resistant animals.''

Had these observations been wider, it would have been found that this condition is as readily observed on both so-called resistant and non-resistant animals, and, moreover, the serum exudes only from those parts of the skin which have been attacked by the young ticks, for when such cattle are dipped, or are freed from ticks by any other method, an almost simultaneous disappearance of the exudate will be readily observed. This exudate of serum which subsequently develops into a dry, hard crust, is a common occurrence on the cattle exposed to tick infestation at Yeerongpilly.

The cow ''Tinkerbell,'' with several of her progeny, and also some of the progeny of the cow ''Clover,'' are still under my control.

As a result of continued observation extending over five years, I cannot find any good reason for varying the opinions expressed in my report of 19th August, 1914.

I therefore strongly recommend that this report dealing with Mr. Munro Hull's claims be appended.

Independent Observations on ''Tinkerbell'' and ''Clover,'' not under Departmental Control.

On 13th April, 1915, the brindle cow ''Tinkerbell'' (grade Jersey) and the black and white cow ''Clover'' (Ayrshire strain) were consigned to Messrs. Butcher and Rex, Maryborough, being loaned to the Wide Bay and Burnett Pastoral and Agricultural Society for over nine months for independent observations.

Various reports were published that these two cows remained free from ticks, while the cattle running with them were always grossly infested.

On 10th December the Hon. A. J. Jones, M.L.C., Messrs. Page, M.H.R., Dymock, and H. A. Jones inspected these two cows and found "Tinkerbell" was heavily infested with fully developed ticks, alive and ready to drop off

The Hon. A. J. Jones, M.L.C., in his evidence before the Select Parliamentary Committee, states that—"As a matter of fact, just above the udder, I do not think it was possible to prick the skin without touching a tick. She was what I call badly infested, and needed dipping or washing."

Some weeks later, Mr. Jones, the Secretary of the W.B.B.P.A. Society, informed me that "Tinkerbell" had died, and that the cow "Clover" would be returned on the 18th February.

On untrucking at Yeerongpilly, I was greatly surprised to find, not "Clover," but the cow "Tinkerbell." On careful search I failed to find any ticks, but ample evidence of recent heavy tick infestation; moreover, there was positive evidence that the cow had been recently treated with some arsenical compound.

CONCLUSION.

The only experimental evidence brought forward by the authors in support of Mr. Hull's claims is that which endeavours to show that on some cows very few ticks will mature and become engorged; but, as I have pointed out elsewhere, the method of conducting these experiments was far from conclusive in obtaining a correct estimate of the number of ticks that matured on these cattle. When conducting an investigation of this character, the practical and commercial value of the results obtained must not be lost sight of, and in this respect the authors and myself have not been able to report favourably on Mr. Hull's propositions.

Though of some scientific interest, it must now be regarded as valueless as a practical means of dealing with the cattle tick pest, and consequently Mr. Munro Hull's alleged discovery cannot be considered as of national importance.

I have consistently emphasised that tick eradication can only be successfully carried out in any given section of country by systematic dipping or spraying of all cattle in a standard arsenical solution, or, where conditions are favourable, by the "pasture rotation method." I am therefore highly pleased to learn from their report that Dr. Harvey Johnston and Miss M. J. Bancroft, B.Sc., endorse my views on the subject.

LINSEED ON THE DAIRY FARM.

We, in Australia, are much inclined to hold cheap those articles which are the production of our own factories, and to consider imported goods superior to ours. This idea is fast losing ground, and our eyes are being opened to the fact that Australian manufacturers can and do produce articles of clothing, machinery, foodstuffs, &c., which easily rival imported goods. Amongst these we may instance the product of the flax plant, and particularly of its seed, well known as the linseed of commerce. Linseed is well known as a valuable food for pet birds, but it has a far greater value in the commercial world, since it yields two valuable products—namely, Linseed Oil and Linseed Meal. A striking example of admirable goods manufactured in Australia is afforded by the group of Linseed products put forth by Messrs. Meggitt, Limited. Those who know anything about the painters' trade are familiar with the trade mark "The Little Boy from Manly," personifying young Australia, as the Linseed Oil in drums that he adorns is known to be the basis of the very best paints and colours to be had in Australia. But not alone is Meggitt's Linseed Oil appreciated by the painter. It has proved a benefactor to the farmer who considers the welfare of his horses, cows, sheep, pigs, and poultry, owing to the proved value of the Linseed meal products by reason of their digestibility, their palatability, and the nutriment they contain. For the dairy farmer they are especially valuable, particularly at a time like the present, when drought conditions deprive the stock of the natural and artificial pasture. The meal adds to the richness of the milk, and helps in keeping the animals in good heart, and in maintaining the health of the herd when food is poor. Oil meal supplies the farm horses with food on which they can do work. It will help the pigs to put on that fine, firm fatness and sleekness that counts for so much when "topping up" for sale. In brief, all animals benefit by this addition to their ordinary diet. When the grass is gone it will keep the sheep from starvation, and the poultry under this diet become early ready for market.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1918.

Article.		DECEMBER. Prices.
Bacon	lb.	9d. to 10½d.
Barley	bush.	5s. 7d. to 6s.
Bran	ton	£7 5s. to £7 10s.
Broom Millet	„	£50 to £60
Broom Millet (Sydney price)	„	£80 to £90
Butter (First Grade)	cwt.	172s. 8d.
Chaff, Mixed	ton	£9 to £10
Chaff, Oaten (Imported)	„	£8 to £9
Chaff, Lucerne	„	£9 to £13 15s.
Chaff, Wheaten	„	£7 10s. to £8 15s.
Cheese	lb.	11d. to 11½d.
Flour	ton	£12
Hams	lb.	1s. 6d. to 2s.
Hay, Lucerne	ton	£8 to £10
Hay, Oaten	„	...
Hay, Wheaten	„	£7 to £8 15s.
Honey	lb.	2d. to 3d.
Maize	bush.	5s. 6d. to 6s.
Oats	„	3s. 10d. to 4s.
Onions	ton	£15 to £16.
Peanuts	lb.	7d. to 11d.
Pollard	ton	£5
Potatoes	„	£11 to £27
Potatoes (Sweet)	cwt.	4s. 10d. to 5s.
Pumpkins (Table)	ton	£13 to £15
Pumpkins (Cattle)	„	£9 to £12
Eggs	doz.	7d. to 8d.
Fowls	per pair	2s. 3d. to 3s. 9d.
Ducks, English	„	3s. to 4s.
Ducks, Muscovy	„	3s. 6d. to 4s. 6d.
Geese	„	4s. to 5s.
Turkeys (Hens)	„	6s. to 16s.
Turkeys (Gobblers)	„	12s. to 35s.
Wheat (Milling)	bush.	4s. 6d. to 5s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	5s. to 14s.
Beans, per sugar-bag	5s. to 8s.
Beetroot, per dozen bundles	1s. to 2s.
Cabbages, per dozen	8s. 6d. to 12s.
Carrots, per dozen bunches	1s. 6d. to 1s. 9d.
Cucumbers, per dozen	6d. to 2s.
Lettuce, per dozen	1s. 3d.
Marrows, per dozen	2s. to 4s. 6d.
Parsnips, per dozen bunches	1s. 6d.
Peas, per sugar-bag	5s. 6d. to 12s.
Sweet Potatoes, per sugar-bag	2s. 2d. to 3s.
Pumpkins (table), per cwt.	13s. to 15s.
Tomatoes, per quarter-case	7s. 6d. to 10s. 6d.
Chocos, per dozen	1s. to 1s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	DECEMBER. Prices.
Bananas (Queensland), per case	8s. to 13s.
Bananas (Tweed River), per bunch	7s. to 15s.
Bananas (Fiji), per case	20s. to 22s.
Bananas (G.M.), per bunch	6s. to 7s. 6d.
Bananas (G.M.), per case	20s. to 22s.
Cherries, per 12lb. box	4s. to 7s. 6d.
Lemons, per case	6s. to 8s.
Mandarins, per case	8s. to 12s.
Mangoes, per bushel-case	6s.
Oranges (Navel), per bushel-case	20s. to 25s.
Oranges (Other), per case	10s. to 11s.
Oranges (Queensland), per case	...
Papaw Apples (Queensland), per bushel-case	10s.
Passion Fruit, per bushel-case	30s.
Peaches, per half-case	5s. to 10s.
Pineapples (Queens), per case	12s. to 14s.
Pineapples (Ripleys), per case	12s. to 14s.
Pineapples (Common), per case	13s. to 15s.
Tomatoes, per case	20s. to 24s.
Strawberries, per box	4d. to 9d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	DECEMBER. Prices.
Apples, Eating, per case	15s. to 17s.
Apples, Cooking, per case	16s. 6d. to 20s.
Apricots, per quarter-case	8s. 6d. to 11s. 6d.
Bananas (Cavendish), per dozen	1¾d. to 5½d.
Bananas (Cavendish), per bunch	1s. 6d. to 5s.
Bananas (Sugar), per dozen	2d.
Cape Gooseberries	...
Cherries, per box	8s. to 12s.
Cherries, per quarter-case	18s. to 20s.
Citrons, per hundredweight	7s. to 8s.
Cocoanuts, per sack	15s. to 25s.
Custard Apples, per quarter-case	...
Lemons (Lisbon), per case	15s. to 22s.
Mandarins, per case	6s. to 9s.
Mangoes, per case	6s. to 9s.
Oranges (Navel), per case	15s.
Oranges (Seville), per hundredweight	12s.
Oranges (Other), per case	10s. to 15s.
Papaw Apples, per quarter-case	2s. to 3s. 6d.
Passion Fruit, per quarter-case	6s. to 10s.
Peaches, per case	4s. 6d. to 7s.
Peanuts, per lb.	7d. to 11d.
Pineapples (Ripley), per dozen	2s. 6d. to 9s.
Pineapples (Rough), per dozen	2s. to 7s. 9d.
Pineapples (Smooth), per dozen	5s. 6d. to 9s. 6d.
Plums, per quarter-case	9s. to 11s. 9d.
Rockmelons, per dozen	10s. to 28s.
Strawberries, per dozen boxes	3s. to 9s.
Sugar-melons, per dozen	18s. to 25s.
Tomatoes, per quarter-case	7s. to 9s. 6d.

TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1918.

Animal.	NOVEMBER. Prices.
Bullocks	£26 15s. to £28 12s. 6d.
Cows	£16 to £19 12s. 6d.
Merino Wethers	43s. 6d.
Crossbred Wethers	42s. 9d.
Merino Ewes	36s. 6d.
Crossbred Ewes	33s. 6d.
Lambs	32s. 9d.
Pigs (Porkers)	54s. 6d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, 1918, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1918 AND 1917, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Nov.	Average Rainfall. No. of Years' Records.	Total Rainfall. Nov., 1918.	Total Rainfall. Nov., 1917.
North Coast.	In.		In.	In.
Atherton	2·36	17	1·82	6·33
Cairns	4·25	36	2·67	7·25
Cardwell	4·36	46	1·73	11·44
Cooktown	2·94	42	0·78	3·77
Herberton	2·49	31	3·77	3·87
Ingham	4·16	26	3·04	10·80
Innisfail	6·51	37	12·34	9·34
Mossman	5·04	10	...	13·26
Townsville	1·92	47	2·48	13·17
Central Coast.				
Ayr	1·83	31	1 20	12·50
Bowen	1·37	47	0·95	6·34
Charters Towers	1·63	36	4·09	4·70
Mackay	3·00	47	2·64	6·58
Proserpine	3·42	15	1·51	8·09
St. Lawrence	2·38	47	5·09	8·01
South Coast.				
Biggenden	2·95	...	1·17	3·28
Bundaberg	2·73	35	1·46	6·48
Brisbane	3·71	67	2·16	12·41
Childers	2·96	23	2·12	7·96
Crohamhurst	4·65	...	0·97	12·31
Esk	3·19	31	2·92	7·54
Gayndah	2·91	47	1·75	7·18
Gympie	3·23	48	1·36	9·81
Glasshouse M'tains	4·27	10	0·58	12·96
Kilkivan	2·60	39	0·74	4·97
Maryborough	3·23	47	0·24	7·93
South Coast—continued:				
Nambour	3·99	22	1·57	14·63
Nanango	2·70	36	1·07	8·56
Rockhampton	2·24	31	0·83	5 61
Woodford	3·09	31	0·72	10·43
Darling Downs.				
Dalby	2·64	48	0·31	5·63
Emu Vale	2·60	...	0·19	4·62
Jimbour	2·53	...	0·06	5·91
Miles	2·66	33	0·47	9·94
Stanthorpe	2·80	45	1·57	4·84
Toowoomba	3·35	46	0·32	8·98
Warwick	2·64	31	0·33	5·11
Maranoa.				
Roma	2·15	44	1·26	2·26
State Farms, &c.				
Bungeworgorai	2·78	4	1·52	...
Gatton College	2·82	...	1·83	7·60
Gindie	2·89	6	3·12	7·16
Hermitage	2·70	...	1·08	5·25
Kairi	3·52	4	1·38	2·49
Sugar Experiment Station, Mackay	2·77	...	2·63	5 97
Warren	4·52	4	0·60	6·81

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1917, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4 57	6·45	5·21	6·42	5·41	6·20	5·58	5·47
2	4·58	6 46	5·22	6·42	5·42	6·19	5·59	5·46
3	4·59	6·46	5·23	6·41	5·42	6·18	5·59	5·44
4	5·0	6·46	5·24	6·41	5·43	6·17	6·0	5·43
5	5·0	6·46	5·24	6·40	5·44	6·16	6·0	5·42
6	5·1	6·47	5 25	6·39	5·44	6·15	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·14	6·1	5·40
8	5·2	6 47	5·27	6·38	5·45	6·13	6·2	5·39
9	5·3	6·47	5·28	6 37	5·46	6·12	6·2	5·38
10	5·3	6·47	5·28	6·36	5·46	6·11	6 3	5·37
11	5·4	6·47	5·29	6 36	5·47	6·10	6·3	5·36
12	5·5	6·47	5 30	6 35	5·48	6 9	6·4	5·35
13	5·6	6·47	5 31	6·35	5·48	6·8	6·4	5·35
14	5·6	6·47	5·31	6·34	5·49	6 7	6·4	5·34
15	5·7	6·47	5·32	6·33	5·49	6·6	6·5	5·33
16	5·8	6·47	5·33	6·32	5·50	6·5	6·5	5·32
17	5·9	6·47	5 33	6·31	5·50	6·4	6·6	5·31
18	5·10	6·47	5·34	6·30	5·51	6·3	6·6	5·30
19	5·10	6·47	5·35	6·29	5·51	6·2	6·7	5·29
20	5·11	6·47	5·35	6·28	5·52	6·1	6·7	5·28
21	5·12	6·46	5·36	6·28	5·52	6·0	6·8	5·27
22	5·13	6·46	5·36	6·27	5 53	5·59	6·8	5·26
23	5·14	6·46	5·37	6·26	5·53	5·58	6·9	5·25
24	5·15	6·45	5·38	6·25	5·54	5·57	6·9	5 24
25	5·16	6·45	5·38	6·24	5 54	5·56	6·10	5·23
26	5·16	6·45	5·39	6·23	5·55	5·55	6·10	5·22
27	5·17	6·44	5·40	6·22	5·56	5·53	6·11	5·21
28	5·18	6·41	5·41	6·21	5·56	5·52	6·11	5·20
29	5·19	6·43	...	...	5·57	5·50	6·12	5·19
30	5·20	6·43	...	...	5·57	5·49	6·12	5·18
31	5·21	6·42	...	...	5·58	5·48	...	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

		H. M.
2 Jan.	● New Moon	6 24 p.m.
9 „	☾ First Quarter	8 55 p.m.
16 „	○ Full Moon	6 45 p.m.
24 „	☽ Last Quarter	2 22 p.m.

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

1 Feb.	● New Moon	9 7 a.m.
8 „	☾ First Quarter	4 52 a.m.
15 „	○ Full Moon	9 38 a.m.
23 „	☽ Last Quarter	11 48 a.m.

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

2 Mar.	● New Moon	9 12 p.m.
9 „	☾ First Quarter	1 14 p.m.
17 „	○ Full Moon	1 41 a.m.
25 „	☽ Last Quarter	6 34 a.m.

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangelwurzels. Pick cotton as the bulbs burst. Do not pick until the dew has dried off the bulbs. Expose the picked cotton for a couple of hours to sun heat.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on "Market Gardening" issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, and are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstemons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the "Agricultural Journal" might be rendered of more value to our fruit-growers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pine-apples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop of fruit ripening towards the end of winter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the State. For long shipment nothing can beat crates holding 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.

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Agriculture.

COTTON-GROWING IN QUEENSLAND.

BY DANIEL JONES, Instructor in Cotton-growing.

"White as a snowflake, warm as May,
Siren of commerce day by day,
In soft serenity upcurled,
She rules the markets of the world."

THE COTTON PLANT—AN IMPORTANT FACTOR IN LAND SETTLEMENT.

Some fifty years since, on the cessation of the American civil war, the cultivation of cotton in Queensland assumed some commercial importance. Belated though the growers were in seizing the opportunity of securing the high values for cotton, the sequence of the fratricidal strife between two sections of one nation, as instanced in the war between the Southern and Northern States of America, this country benefited much by the occasion, ending in dire misfortune to Lancashire spinners when the shortage of cotton brought our countrymen to the verge of famine. These untoward circumstances in America and England compelled attention to the potentialities latent in Queensland in respect to the culture of cotton. The civil war being over about the middle sixties, our farmers, by that period, had scarcely got into a stride in the production of cotton, and not until the Americans had considerably recovered their normal position as cotton growers did we, in Queensland, start to grow this article in considerable volume.

Zenith was reached in the years 1869 and 1870, when in the former year 14,426, and in 1870-14,674 acres were under tillage in the southern districts of this State.

Subsequently a rapid decline eventuated, the chief reason being the rapidly falling market due to the resumption of cotton growing in the war-devastated States of America, added to which were serious troubles due to attacks by the cotton boll worm, and experience being lacking in the treatment of this pest, many growers lost heavily by its ravages.

An added difficulty was the expensive charges, the slow transport in those days by sailing vessels to England, and uncertain delivery; dependent as growers were entirely on sailing ships to carry cargoes abroad. Fibre on which farmers realised up to 4d. per lb. dropped in value to as low as 1d. per lb. for cotton in seed, which naturally discouraged further developmental work in connection with the industry.

THE BONUS QUESTION.

A considerable amount of misconception has gained ground as to the amount of assistance this industry has obtained by bonus from the public treasury. It is frequently asserted that as soon as the bonus provisions lapsed the industry collapsed. Nothing of the kind occurred, for the very sound reason that the bonus provisions of £5 per bale exported had ceased to operate long before cotton growing was discontinued. We found that when the value of cotton was equal to what it has been during the last fifteen years the profits accruing were satisfactory, but a drop to a penny per lb. for raw cotton in seed was largely a non-paying proposition; hence, farmers speedily left off growing the crop. However, the bonus paid, being in the form of a land order to the producer of the cotton, had, indirectly, a beneficial effect on the close settlement of what are now the most prosperous farming districts of Southern Queensland.

Evidence of this may be seen by any traveller through the Logan, Fassifern, and Rosewood farming centres. Here one realises the value of diversified farming, and small holdings furnishing a large population with a profitable means of livelihood.

Most of these areas were selected by farmers who, for their sons, utilised the bonus land order to take up homesteads of from forty to eighty acres, and those districts are studded to-day with comfortable homes and farm plots, due largely to the impetus given to this the best form of home-making by the utility of the cotton plant as the factor in closer settlement.

Hundreds of farmers grew cotton in that period after the lapse of the bonus; hence, much of what is surmised as to the effect of the bonus lapse is entirely mythical.

When a revival of the industry occurred about the year 1890, due to the unselfish efforts of the farmers and mercantile community in Ipswich, whose ambition was to revive the industry not only on growers' account but as relating to textile manufactures, a further bonus was sought for, and after much delay and opposition a proviso was made by the Legislature that on the manufacture of five thousand pounds' worth of calico or other cotton fabrics the money would be paid. This regulation prompted those interested in the industry to establish the Queensland Cotton Manufacturing Company, which, after much effort, was capitalised to a very insufficient amount and started operations at East Ipswich.

After a struggle for about five years, the company ceased operations owing to insufficient capital, but primarily to the apathy displayed by the Government then in power, in not safeguarding the interests of the company by carrying out tariff regulations provided by the Customs Act. This can be best explained by a brief discursive statement of fact. The directors, after some inquiry and tests, discovered that a line of manufacture best and most profitable for the company's activities related to the making of Turkish and Honeycomb towels. The necessary machines were expressly imported from England to perform this work, the incentive being a duty of 15 per cent. on this class of goods, as against a free tariff, or at most 5 per cent., on the other articles made in the factory, which for the most part comprised narrow calicoes, broad sheeting, twills, cellular cloth, butter and cheese cloths; all of superior excellence, which speedily caught the attention of the local trading houses.

Our enterprise in making these towels was, for a period, eminently successful, until importers of cotton textile goods in the State found that by importing towels in bolts, the selvage being uncut, they were classed as piece goods and admitted duty free. This proved the Waterloo of our textile manufacturing at Ipswich, and from that time the plant has been largely scrap iron.

I have emphasised this feature of our manufacturing enterprise in order to correct a false impression that the cotton growing and manufacturing industry failed by inherent economic conditions adverse to the enterprise rather than those which could, by a little business acumen and sympathetic treatment, have been entirely avoided, and a useful industry be continued, particularly as economic conditions have improved in relation to this pursuit.

THE LABOUR ASPECT OF COTTON GROWING.

Perhaps no misconception has taken a greater hold on the mind of the community than the idea that cotton growing is and must be associated with cheap labour, be it coloured or white.

It is eminently true that much fibre is grown under conditions where the cost of labour is low; nevertheless, it is easy to demonstrate that low-priced labour is often costly, as evidenced in the cotton industry elsewhere. This aspect frequently comes under observation, and is instanced in the character of the coloured man in particular, who is held to be the example, *par excellence*, of cheap labour.

Some time ago I was able to show in a letter to the "Manchester Guardian," a leading British manufacturers' newspaper, that their efforts to grow cotton in Central Africa by native labour proved more expensive than was the case in utilising white folk in the industry in Queensland. The same has happened in Papua, where a friend has charge of a cotton plantation, and who averred that native labour, though cheap in cost, was too slow for the work, and who declared that to gather the fibre entailed a cost of 2d. per lb.

Knowing the celerity of the coloured man by personal observation of his work in Queensland, Papua, and New Caledonia, I am confirmed in the idea that the white man has no peer in the cotton field and that it is a crop eminently fitted for white activities, and, moreover, a very profitable one, as present experience clearly demonstrates.

An example came under my notice during a recent visit to the north of Queensland, where a friend, in confirmation of my long-formed opinion on this question, substantiated my contention thus:—He tested the ability of aboriginal labour on a cotton field in the North, and instanced the fact that twenty hands gathered but ten pounds of fibre in two hours. A practical commentary on that is evidenced by a test I made recently in the Maranoa district, when, in association with three juveniles, we picked at the rate of ten to twelve pounds of cotton per hour without undue pace-making. A fair acreage allotable to each juvenile or adult white worker in Queensland for a season's picking would be about fifteen acres for each person able to hustle. This being worth (at pre-war values) from £10 to £15 per acre, will give a hint as to the earnings possible to obtain.

An All White Cotton.

From the foregoing remarks, founded as they are on demonstrable fact, it becomes feasible to accept the idea that in the Commonwealth it is practicable to make of this industry one that will become a profitable avenue of rural enterprise to any who may elect to engage therein. There are various reasons for the contention that this vocation can be carried on entirely by white labour earning a fair remuneration from all its branches, whether it be the rural or textile features of the industry.

I have shown what a factor this pursuit has been in the early settlement of this country. I well remember, fifty years since, raw immigrants, British and Continental, arriving in hundreds weekly, immediately locating themselves in scrub or forest areas, and by means of the cotton plant becoming self-supporting with only self-reliance and the storekeepers' guarantees to furnish the bag of flour, tea, and sugar.

Hundreds of prosperous settlers or their descendants can verify this statement; hence, what is most required to make cotton growing a foremost industry, as it once was, is immigration coupled with a scheme of ready-made farms on which the folk can locate immediately on arrival if they so elect.

A factor evidently overlooked by many who have but a limited knowledge of this question, is the repeated insistence that men must be trained to become successful settlers. This contention is largely discounted by our experience in the early days of this (then) colony. Families arrived who did not know anything of our seasonal or climatic conditions, yet made good, largely owing to the facility with which one can learn how to handle the cotton plant.

An economic feature related to most tropical pursuits is often disregarded, which is, that tropical products on the whole require much less experience or ability to produce than those related to temperate climes. This is patent to any who have travelled in the tropics and who realise with what ease the coloured native gains his sustenance from soil, sea, or palm.

Our only hope in settling a prosperous community on the land and in adequately increasing rural industries is to speedily emulate the American methods of preparing homes for prospective settlers, be they soldiers or civilians. Our national prosperity relates largely to land settlement, without which our vast continent will remain unproductive.

Our Gold Reserves—Where do they Exist?.

The writer has, on many occasions, provoked a smile when using a homely but effective argument in relation to this subject. Some ten years ago, when visiting the Charters Towers district in connection with a movement to advance cotton growing, I pointed out that at the then lower value for cotton, every acre in and around the Towers had under the sod a potential wealth of one ounce of gold annually to the acre clear of the cost of obtaining it.

The comparison has evidently borne no result, for to-day this plant is not in favour although it demonstrates its value by persisting in a volunteer fashion to indicate its adaptability for that region.

Last June, when paying a further visit to that centre, finding the whole place decadent by virtue of the reefs panning out and no further developments in prospect, in order to comfort the few who still realise that if gold in the reef fails, the sod will not do so, I pointed out that at the present advanced value it is quite possible in this area to win not one ounce per acre, but double that amount, free of cost of raising the crop. The farmers in the Ipswich and the Maranoa and other places have, in some instances, raised from £15 to £25 worth of cotton to the acre this past season, the accruing costs of winning this article in each instance being in the vicinity of £6 to £8 per acre, which should more than cover all expenses.

This indicates that in any suitable cotton-growing region it is within the ability of any farmer to win the equivalent of one to two ounces of gold from each acre tilled.

This fact proves how advisable it is to expedite the tillage of the cotton shrub in the common interest.

COTTON A CRUTCH TO OTHER PURSUITS.

Past experience has abundantly demonstrated that this vocation materially assists the development of collateral industries.

This is particularly true of the dairying interests, and speaking from personal experience on this matter, there is clear evidence of advantage to the dairying industry arising from association with the cotton grower.

It was common practice among early settlers to pasture their cows and other stock on the harvested cotton plots, finding therein valuable forage at a period when pasture was scarce.

Our experience was that nothing need be apprehended during the winter period or early spring owing to absence of grass on the ordinary pasture lands. Our fields were picked over by the end of July, or in some instances earlier, when the plantations were available for stock pasture. It frequently happened, despite all the attention paid to tillage, that an abundant weed growth, such as carrots, thistles, and other valuable herbage, would grow in the cotton fields subsequent to the period of laying by the crop, which usually happens when the plant growth interferes with horse or hand cultivation. On these occasions our stock became fat and sleek owing to the nutritious pasture available. Our working horses acquired a sound condition for future work, and our cows rapidly increased the milk supply and put on condition.

Hence dairying is assisted materially by a diversified method of crop raising, and cotton is the most valuable of our crops.

COTTON AND SHEEP.

This combination has much to recommend it to prospective settlers inasmuch as a smaller holding can be successfully used for settlement purposes if sheep and cotton be accepted as the combination relied upon. The same factor holds good in respect to sheep pasturing on cotton fields, as instanced in dairying, and, moreover, perhaps with a greater advantage.

Sheep raising, as is well known, is much stimulated by the nature of the herbage available for the animals. Instances are on record where, in a period of severe drought, the farmer has saved his sheep by the sacrifice of the cotton crop.

This does not mean, however, that the shrubs are seriously affected for the coming crops. Our method, in regions of low frost attack, of growing the plant as a perennial allows of the feeding down of the shrub without seriously depreciating the value of the future yield of fibre. While it is claimed that a valuable asset is thus to hand as a relief in drought periods, it is not by any means claimed that cotton should be regarded as a perfect fodder for stock. All that is intended to convey is, that at a time of dearth in an emergency cotton may be depended on to afford relief when other means are unavailable.

Another factor of value is noted in the phase that cotton induces a new form of herbage, often adding a great improvement to the carrying capacity of the farm. To obtain the best results from cotton and sheep it is expedient to till, every three years or so, a fresh piece of the farm land, so that, by the influence of the plough, the old or unnutritious grass may be supplanted by new and improved forms of herbage.

Cotton seed is well known to have a leading place in foreign countries as an element of edible fat manufacture. Compound lard-margarine making is related to this industry and, strange to say, contrary to general opinion, it is claimed by experts on the question that the extension of margarine manufacture will have a stimulating effect on the dairying industry by reason of the proportion of milk required to make first-grade margarine.

As Human Food.

The American Department of Agriculture, in pointing out the merits of this crop, claims that the nutrition contained in cotton seed is equal to that of wheat.

It is, moreover, stated that in cases of diabetes bread made from cotton seed is a remedy for that dire complaint.

As a stock food for fattening sheep and cattle its merits are not challenged. "Hoard's Dairyman," the leading American dairy journal, recently complained of the local farmer selling his cream and buying margarine for his domestic use.

The electrician has found that the residue from the oil mills, a hitherto waste product, can be and is utilised in insulation work, and that the huge cables which we see cross the city streets owe much of their value as insulators to the processes to which cotton seed has been subjected in the industrial world.

It is the Crop that Feeds and Clothes Us.

The United States alone produces from 12,000,000 to 14,000,000 of bales of 500 lb. each annually. About 12,000,000 persons are engaged in the production and handling of this immense crop.

The value of the American cotton crop and of the by-products, such as cotton seed linters, oil, and oil cake ranges from £300,000,000 to £350,000,000 sterling in value.

England imports about £70,000,000 to £100,000,000 worth of fibre every year, not to speak of other materials, such as cotton seed and cotton seed oil.

It is estimated that considerably over 3,000,000 persons are, in Lancashire, directly interested in the cotton trade, and a further 10,000,000 inhabitants of Great Britain are directly or indirectly connected with the industry.

Queensland's Opportunity is Now,

when the changing times make it practicable to promote a huge influx of new settlers, as well as to accommodate those who are here who elect to pioneer the country by making suitable provision for the families who may again be encouraged, as in the past, to come and make Queensland their future home, and who would be welcomed, particularly if of our own kith and kin; as was the case fifty years ago when sailing ships landed immigrants by the hundred every week, and who were speedily absorbed, by reason largely of the advantage of cotton-growing being held out to them, who thereby soon made a competence by their industry and thrift.

I have, for reasons not to be indicated, confined myself to generalisations on the vocation. The practical evidence to hand relating to the treatment of the crop in its cultural phases will be amply outlined in a further article.

Suffice it to mention that there are waiting for landless men thousands of acres eminently suited to cotton culture adjacent to railway lines or water transport, which can be placed under this crop at a lower cost than is possible in any other cotton-growing country.

Cotton a Drought Resister.

Once the planter has his cotton plants established, droughts can be regarded with comparative indifference. The hardihood of the shrub in this respect has been tested in past seasons, when other crops owing to dry weather conditions have perished, while this plant has flourished, as it is now doing during the present dry time, little affected by the lengthy absence of rain (January, 1919).

Some years ago, in the Central district, during an unusually dry period, when even forest trees dried out, the cotton shrub resisted weather conditions and persisted right through the trying ordeal, thus indicating its value as a reliable crop during unseasonable weather conditions.

Bearing on this aspect of the question, the recent experience of American growers proves the use of the crop in times of drought. Press reports from Texas, the leading cotton State in America, detail a harrowing description of a drought experienced last year. It is said that the large stores of cotton seed meal held enabled stock owners to save a million head, and it is stated that had a further supply of cotton seed meal been available, a further half-a-million head of stock would have been saved from starvation. The few facts here set forth of the value and adaptability of the cotton plant as a factor in Queensland farming activities, prove that in this crop we have a wealth producer, and no time should be lost in bringing under the notice of prospective settlers the eminent value of this most lucrative pursuit.

Next to prickly-pear and Japanese rice paper plants in evidence here, cotton is the best drought-resisting plant hitherto observed.

THE PRESERVATION OF PERISHABLE PRODUCTS WITH BURNT LIME.

By C. B. BROOKS, Instructor in Agriculture, Rockhampton.

Lime is a product that is to be found on most farms, more particularly those on which dairying is engaged in. There are other purposes, not generally known to the man on the land, to which it can be put, besides making whitewash.

That it is an excellent preservative for a number of products, culinary and otherwise, has been the experience of the writer. It has been tested in regard to the preservation of fruits, tubers, and grains. The method adopted will be described by taking a single example from each of the above.

In the storing of various products it is essential that they should, in most instances, have reached the stage of ripeness, or maturity, and moreover that immediately after harvesting they be allowed to undergo what is generally termed the "sweating process." This is the giving off of surplus water, and chemical changes may also take place to a more or less extent.

FRUIT.—ROUGH-SKINNED LEMONS.

These are to be found in abundance in most districts during the cool months of the year, but in the hot summer weather they are generally not procurable. This of course is on account of their poor keeping qualities, more particularly in coastal areas, where, after picking, they will remain fresh for only a very short time.

During the past season rough-skinned lemons, which I stored in petrol tins during August, were found to be in an excellent state of preservation at Christmas. The treatment received was as follows:—

When picked they were spread out in a shaded, airy place for two days, then packed in partially air-slaked lime, the fruits being kept well apart. If close packing is adopted, it will probably be found necessary to repack in about a week's time, more particularly if the skins of the fruit are in a soft, fleshy condition. A wooden case may be used for storage. This can be made fairly airtight by lining or covering with stout paper.

In a check test carried out without using lime, the lemons deteriorated very quickly.

It may be mentioned that Lisbon lemons can be kept fresh for quite a long time, by packing in sand that has been thoroughly dried.

SWEET POTATOES.

It is important that the tubers for storing should be fully matured. This is ascertained by breaking a few and leaving them exposed to the air for about an hour. If ripe, the cut surface should remain white, or nearly the same colour as when cut. If it turns black, or greenish-black, they are not mature.

Sweet potatoes have been kept for six months simply packed in air-slaked lime. Being a bulky product, a test was made last season by using less lime and substituting sand, in the proportion of one of lime to four of sand. The potatoes were first rolled in lime, and packed in a wooden case (not airtight) with the above mixture. At the time of writing (January) they are quite as sound as when stored in August. To keep them fresh for a shorter period, roll in lime and store in a cool dry place.

ENGLISH POTATOES.

Judging by the number of inquiries received, difficulty is often experienced in keeping English potatoes—intended for seed—for an extended period. A cool, well-ventilated building with a dry floor is essential to success. The tubers should be spread out in layers (dusting with lime during the process), then covered up with either very dry sand or a mixture of sand and lime. If rotting is at all in evidence, an increased amount of lime should be used. Where the potato moth is troublesome, and sand only has been used, a thin layer of lime should be spread over the top. All spaces between the tubers should of course be filled by the sand, &c.

PRESERVING SMALL LOTS OF GRAIN FOR SEED PURPOSES.

It is well known that unless special provision has been made in the way of airtight tanks, fumigation, &c., it is a most difficult matter, on the coast, to keep seeds such as cowpea, grain sorghums, maize, &c., free from weevils.

It has been found that weevils cannot multiply in grain unless it contains a certain percentage of moisture. In wheat, for instance, there has to be at least 10

per cent. present. When harvested it invariably contains from 6 to 7 per cent. moisture, and is therefore weevil-proof.

A simple method of keeping the moisture content under weevil requirements is to use a vessel or container as airtight as possible, such as a tank, petrol tin, old cream can, &c., and when storing seeds to include a quantity of freshly burned lime. In the event of the container not being insect-proof the bags containing the seeds should be covered right over with the lime. In fact the lime can be mixed with the grain without detriment. In order to ascertain whether lime would be injurious to vitality a number of maize cobs and grain sorghum heads were buried in partly air-slaked lime, in the month of June. A vitality test was carried out in September, the maize giving 100 per cent. and the sorghums 98 per cent. germination. A further test was made at the end of December with practically similar results.

The cost of the lime used in the preservation of perishable products would be almost nil, as it can afterwards be applied to the land with, in most instances, considerable advantage.

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS—No. 2.

By P. MAHONEY.

COLLECTION AND DISTRIBUTION OF WATER.

When installing an irrigation plant, it is most advisable to secure a plant of large capacity, as it is necessary to irrigate speedily to secure the best results, for cultivation is most essential for successful irrigation, and to secure a thorough cultivation, it is necessary to have the ground evenly watered in quantity and time. Therefore, to be able to irrigate a large piece of ground, it will be necessary to have a fair-sized plant, so that the distribution of water may be on a par with the cultivation requirements. In this manner the cultivation will become sectional.

The disadvantage of a plant of small capacity is that it takes longer for a small stream to water the ground thoroughly, and when it runs for any length of time it is apt to be unevenly watered, as the land nearest the outlet will get too much water before the bottom of the land has had enough. Thus, by the time the land nearest the outlet is fit to cultivate (which will be considerably longer than the bottom portion, on account of it getting more water) the bottom portion will have lost the most of its moisture through evaporation, thus deriving very little, if any, advantage by the irrigation, and overwatering is likely to prove disastrous.

After installing a plant of the capacity required for production of the water, comes the economic means of conveyance and distribution of same, either by the furrow system or by flooding the land.

The furrow system is undoubtedly the best and the most indulged in, but in many cases, such as in growing lucerne and such crops, the flooding system has to be adopted.

For fruits, vegetables, sugar-cane, maize, or other plants that are grown in rows 3 feet or more apart, the furrow system is the most successful way, for it is possible to give the ground a thorough even watering in this manner. After the water leaves the discharge pipe it is delivered into a small tank or well, constructed of concrete or bricks. This tank should be about 3 feet square, and be built to a level higher than the ground to be irrigated so as to enable the water to be conveyed by gravitation from the tank to any part of the ground, and by having the discharge and delivery pipes disconnected, a rush of water and undue pressure are avoided, thus enabling the supply of water to be easily regulated. In this manner water can be conveyed in several directions at the same time, by having two or more outlets in the tank.

The pipes leading from the receiving tank, through which to convey and use the water, should be regulated according to their length, for the longer they are, the greater the fall should be. A quarter of an inch in the chain is enough fall for any distance over 5 chains, and under that less. When a pipe has got a quarter of an inch fall to the chain, it should have valves about every 5 chains for shutting off the water, so as to afford a quick and effective watering and also avoiding any undue pressure. If the pipes are to go over uneven ground, then it is necessary to have the valves closer than 5 chains.

The best means of conveying the water from the pipes is through a canvas hose, varying in size according to the stream that is required. Outlets should be made every 20 feet along the pipe on which to fasten the hose, which conveys the water into the furrow which runs parallel with the main pipe. From this furrow, the water

is allowed to run down the furrows alongside the rows of plants in the required quantity. If the main pipe is sectioned off into 5-chain lengths with a valve, three or four of the canvas hoses can be connected up at a time. By using the hose an enormous quantity of water is saved, which otherwise would be absorbed by the land between the main pipe and the plant, which would be of no benefit, except in the case where fodder is grown. Where plants are grown in rows, a 20-foot headland is required to facilitate turning when cultivating and making furrows for watering purposes.

When the flooding system is employed, no headland is required, for it is not possible to cultivate under those circumstances, as the plants in these cases are grown within a few feet of the main pipe. In flooding beds which are under fodder, such as lucerne, it is advisable to first water the bed which is farthest away from the outlet, the water being conveyed to it through pipes in the division banks, closing up each pipe as the beds become sufficiently flooded. If watered in this manner no surplus water is lying about.

Concrete or even earth channels can be used for conveying and distributing the water on to the land, but under these systems the evaporation and soakage are enormous. On the other hand, where a big stream can be produced at a little lift and cost, such channels would suffice, as a large acreage can be irrigated in quicker time than with the pipes. Where only a small piece of land is irrigated, the pipes would prove the more satisfactory.

(To be Continued.)

AGRICULTURE AT THE PRIMARY SCHOOL.

Mr. H. R. Julien, agricultural engineer, wrote as follows on this subject in the *Revue Générale Agronomique* of February, 1901. The subject being of special interest to an agricultural and pastoral community such as ours in Queensland, we give our readers a translation of the article:—

AGRICULTURAL INSTRUCTION IN PRIMARY SCHOOLS.—THE PROFESSION OF THE AGRICULTURIST SHOULD BE HIGHLY ESTEEMED.—WHAT SHOULD BE LEARNT?—OCCASIONAL AND REGULAR INSTRUCTION.—CONCLUSION.

The principal object of instruction in agriculture in the primary schools should be to cause agriculture to be understood, honoured, and loved as it deserves to be; to elevate the profession in the eyes of the pupils as much as possible; to develop a taste in young people for the profession of the farmer, which is unjustly despised and treated with contempt in certain parts of the country. If farmers are exposed to many reverses, resulting from epidemic diseases, from accidents, from failure of crops; if, during certain seasons of the year, they have to do heavy, prolonged, and laborious work, it is none the less true that those who devote themselves to an intelligent cultivation of the soil find in their labour a satisfaction and pleasure which, other things being equal, one would look for in vain in most of the other professions.

Children in rural districts should learn at their school—when they have finished their term of study, they should be profoundly convinced that the farmer carries on an honourable and independent business; that agriculture is the most important of all national industries; that it is an inexhaustible source of wealth, for it alone produces, whilst other trades confine themselves to transforming the products of the soil and the materials elaborated by plants under the influence of the sun's rays.

To reach with certainty this highly desirable result, the germ of it must be implanted in the mind of the young pupil by giving him correct ideas of the conditions under which the agricultural industry must be carried on at the present day.

There is no one so well able to work upon the intelligence, the tendencies, and the tastes of children as the capable instructor who is imbued with a deep sense of the noble mission confided to him.

To cause agriculture to be esteemed and loved by children, they must be shown how estimable and worthy of their love it is. The profession of the farmer does not solely consist, as some even yet believe, in a routine or in machine-like work which the first-comer can rapidly acquire without any effort by personal experience or by observing how things are done in his neighbourhood. On the contrary, it is a science which must be carried on by intelligent people who know how to get at the why and wherefore of the operations, as numerous as they are varied, which they undertake.

It is not, therefore, sufficient to bring under their notice but to make them see and understand the different kinds of work done in the fields, the orchards, and the farms. It is the most suitable means of making them acquire a reasoning knowledge, a knowledge of daily application concerning the cultivation of various plants, the study of domestic animals, of parasites, of the nature of arable soils, of the value and action of manures, of the multifarious labours of the farm.

It is not necessary to learn everything at the primary school, and no sensible person would pretend to educate the pupils there to become finished farmers. But what may be demanded of them is that at the end of their school life they should possess sufficient knowledge to continue to instruct themselves by the observation and interpretation of such phenomena as frequently present themselves when reading the daily papers, reviews, and agricultural works, by the assistance everywhere given at agricultural conferences by State experts in agriculture, by the dairy experts, by the professors of courses of agriculture for adults, professors of horticulture, of market gardening, of apiculture, &c.

To attain this end, it is not sufficient to let them learn some manual by heart, but it is indispensable to develop in the students a spirit of observation, to inspire them with a taste for study, to make them acquire those fundamental principles which are indispensable to a clear understanding of the subject.

Is *occasional* instruction sufficient to arrive at this result?

Evidently it is not. It is decidedly necessary for the instructor to seize every possible opportunity to instil into the minds of the students useful ideas concerning the farmer's profession, but such instruction must be complete, and it should be preceded by *regular and didactic* teaching.

A rigidly straight course must be adhered to—a logical sequence—in order that the child may not be confused with a mass of jumbled-up ideas which are disconnected, and do not fit in one upon the other. Regular instruction should form the basis of the whole edifice. It comprises the study of the principles of the fundamental laws on which the science of agriculture is founded.

Occasional instruction is the indispensable complement of regular instruction. Its aim is to make itself understood by well-chosen object lessons, by walks abroad, by conversation, by problems, by excursions, by practical work, by experiments. It must force its way into the intelligence of the child, and consequently this theoretical instruction must not consist of lessons "by heart," but it must be digested, assimilated, understood.

One must not deal merely in words or definitions, but the teaching must above all develop in the pupil the ideas, the reasoning powers, the aptitude to instruct himself later on by his own energy and of his own accord. And this is precisely the reason for reducing everything to scientific principles, and of accepting or rejecting good and bad methods according to whether they agree with or are opposed to the immutable laws which regulate the matter and activity of living beings.

It is only in this manner that the primary school will evolve intelligent cultivators of the soil in numbers anxious to follow with determination and prudence the modern methods by which agriculture, forced by necessity, has since a considerable time begun to elevate itself.

Agricultural teaching is too often as wearisome as barren of result, because a wrong direction is taken, because teachers allow themselves to be guided by a defective method. At the same time we do not deny, having seen them at work, that many teachers stand at the head of the noble and important mission entrusted to them, and we do not hesitate to assert that their fruitful lessons and instruction have had their share in the immense progress achieved during these last few years in many parts of the country.

[We could instance several State schools in Queensland where the teachers are carrying out the work of agricultural instruction with eminent success.—Ed., *Q.A.J.*]

HOW THE EXTENSION OF AGRICULTURE BENEFITS THE CITY WORKERS.

How to keep our boys and young men on the land has been a problem which individual farmers have solved for themselves, but which still remains a problem to the generality of them. There was a time in the old country when farms descended from generation to generation, the young people never dreaming of doing anything but following in their fathers' and grandfathers' footsteps, turning and re-turning the furrows as they were turned and re-turned a hundred years before they were born.

Why, then, is it that the farmers' sons and daughters no longer care for what they consider a humdrum life of toil without adequate remuneration? The causes may be found in (*a*) education, (*b*) increased facilities for travelling, (*c*) the attractions of emigration, (*d*) the attractions of the towns.

How is education answerable for the abandonment of a rural life? It is not education itself which is answerable, but it is the kind of education given up till very lately in every school—primary, national, grammar, and private schools—in all Great Britain and her colonies. Nothing has ever been taught in any of them, tending in the remotest degree to educate a lad or a girl to rural occupation. The whole system has fitted the student for nothing else but the professions, for clerks, shopmen, &c. They have learned to be, according to the old schoolboy oracle, either soldier, sailor, parson, tailor, ploughboy, apothecary, gentleman, or thief. Note the ploughboy; no mention is made of the farmer. The boy was not taught anything so low as agriculture. The farmer's boy goes to school. He learns Euclid, Latin, algebra, grammar, geography, probably dancing, and the piano, all things most useful to a farmer. What he has thus imbibed gives him the idea that with these accomplishments he can do better in the city, enjoy more—not comfort, but leisure—and have more pleasures than are possible on a farm; so the deluded youth, deluded and robbed of an honourable, independent profession by those blind guides who professed to fit him for his passage through life, this much-wronged lad abandons the farm and becomes a city office boy or clerk, and he is lucky if ever he rises to be anything but a clerk. What he has not learnt at those schools has been what would have given him a keen interest in the land and its crops, what would have lightened his labour, what would have increased his and his family's comfort, and what would have helped to swell his banking account, and what would have made him for ever independent of those city masters who grow wealthy by the sweat of the brow of their servants.

In this sense, then, we say that education has been one of the factors in drawing the farmer's son from the land.

Next take the increased facilities for travelling. A hundred years ago farmers rarely saw any other town but the nearest market town of their own country. A visit to "Lunnon town," Dunedin, or Dublin was hardly ever dreamt of by the boldest farmer. And if he did travel 100 miles he first made his will, the wife of his bosom and the household generally wept in unison, and if he returned safely he was looked on as a wonderful traveller. In Australia it used to be much the same thing. Before railways were built the roads were mere tracks, all travelling was done on horseback or by bullock dray, bushrangers were not unknown, and living in the larger towns was very expensive. So the plain or scrub farmer only visited the town at which he sold his produce. There was no inducement for the young men to settle in the towns, because there was no opening for them, trade was small, and amusement was rare.

See how things have changed. The railways came along, goldfields, coalfields, opal-fields, tinfields, copper, and, best of all, canefields sprang into existence. All kinds of businesses, trades, and professions offered employment to young men possessing only the education we have indicated. Distance had been annihilated. The educated farmer's son could take employment in the large towns at a low salary, because he was able to travel by rail at a cheap rate and live with his parents. Then he soon imbibed a love of town life, and a dislike for the toil and vicissitudes of farm life. If he were inclined towards mining, the railways, steamers, and coaches carried him quickly and comfortably to many of the gold, tin, or copper fields, whereas in the early days the weeks of dreary tramping to reach his destination deterred him from leaving home.

The British farmer's son inclined towards a life of adventure is induced by the alluring pictures presented to him by the immigration lecturer to leave his home and try fresh woods and pastures new. The unknown attracts him. He is weary of the monotony of old country rural life, and paints a fancy picture of life under sunny skies and under more exciting conditions, not knowing that 'tis but distance that lends enchantment to the view. But what is loss to the British agricultural population is gain to the colonial, for these farmer immigrants usually enter upon farming pursuits in the colonies. Their descendants, however, at the present day, are more attracted by the allurements of town life. The flannel shirt, canvas trousers, heavy bluchers, and slouch hat are gladly discarded for the more elegant costume of the city. The early and late hours necessitated by the routine of the farm are exchanged for the late hours of the city—late to bed and late to rise. The theatres, dances, concerts, exhibitions, and picnics, the afternoon saunterings in the busy street, the convenience of 'buses, trams, cabs, trains, excursion steamers—all these tend to wean the farmer's son from a life of honourable independence to one of ill-paid servitude. Compare the young farmer with the young city clerk or budding civil servant. The former is engaged in a healthy pursuit, in a life-giving, open-air occupation. His house is his own, his land is his own. He owns no man as master. He has no troubles about rent, and very little has he to do with the butcher, baker, grocer, or

draper. On a well-managed farm many household requirements are produced which the town dweller has to pay for. If he wants a holiday of a day, a week, or a month he has no one to consult but himself. His occupation, so far from being monotonous, is one of endless variety. The changes of the seasons, even of the weather, bring constant change to his work. Science and invention have placed powers in his hands which have reduced hand labour to a very limited sphere in the operations of the farm. True he suffers many disappointments. He has to take the chances of drought, flood, caterpillar, locust, parasitic and fungoid diseases attacking his crops, but this only stimulates him to action, and lends additional attractions to his occupation, inasmuch as he is by these troubles compelled to study the remedies. If farmers, taken as a body, are not men of great wealth, they are in comfortable circumstances. They have to obtain advances on their crops, says a carping critic of these lines. Possibly, indeed very probably, this contingency will often arise. But so good is the security offered by the farmer that in all civilised countries of the world (except a few, in which Queensland is included) agricultural banks have been established which make advances to farmers at very low rates of interest, and it is not too much to say that for one farmer who goes into the insolvent court 10,000 shopkeepers, merchants, clerks, middlemen, and other business people of the towns take advantage of the insolvent laws. In conclusion, let us ask what is the result of the exodus of the rural population to the towns? It may be stated in a few words. The additional strength poured into the towns, which, as a rule, are generally overmanned with would-be workers, must necessarily tend to the reduction of wages, to an increase of taxation; and the low rate of wages from which the taxes have to be deducted results in much distress amongst those who are bound by family ties to live as best they may, obtain work as best they may, in cities where the influx from the country has cheapened labour or rendered it almost impossible of attainment.

We set out with the intention of showing "How the Extension of Agriculture would benefit the City Worker." We have shown how the city worker is injured by an oversupply of workers from the country districts. But, with our rich agricultural lands thrown open to selection on easy time-payments, with the repurchase of such fertile estates as the Government has so wisely bought back from the owners to sell again to the farmers, with the removal of any restrictions upon selection, the construction of light railway lines or even tramlines as feeders to the main lines, the sinking of bores, the dissemination of information by means of travelling experts, the removal of prohibitive duties on agricultural machinery, and on everything required by the farmer for conducting his business, the lowering of railway rates on agricultural produce, the distribution of seeds, the importation of new varieties of plants, of stock of all kinds, the establishment of agricultural colleges and of State experiment farms, the free issue of agricultural literature, the holding of annual agricultural conferences—with these and a host of other advantages we could mention, the extension of agriculture must follow as a matter of course, and as thousands of acres of new land come under cultivation the demand for not mere mechanical farm drudges, but for workers on scientific principles with scientific appliances, must at no distant date result in relieving the towns of the best, healthiest, and most honest labourers and mechanics. As a consequence wages in the cities must rise, the cost of living would be reduced, and the up-to-date farmer could afford to pay a reasonably high wage to his men.

How, then, is the depopulation of the farms by the exodus of the sons of the house to be prevented? By affording less facilities for the education of rural children?—by reducing the facilities for travelling? On the contrary, it is by doubling and trebling these facilities that the object is most likely to be attained. It is the class of education that demands immediate reform. The curriculum of the rural primary school should have a totally different trend. Does anybody doubt this? Then, we say, look at the work done by the agricultural colleges of Europe, America, and in a lesser degree of Australia. Compare the numbers of those who have attended the higher schools of the ordinary classical or commercial type and the numbers of those who have gone through the three or five years' (in some cases) course of a good agricultural college; then follow the career of each batch of students. Those who have received the stereotyped school training will, taken as a whole (there are very many brilliant exceptions, of course), be found to hold positions in no way comparable to those held by students with the agricultural training. Hundreds, aye thousands, of young men have gone from the agricultural colleges into the world either as farmers of their own land, as graziers, as agricultural chemists, as farm managers, creamery and factory managers. They entered college with these objects in view, and they are successful, independent men. The ruck of the other schools hold their positions on a very precarious tenure. Let a panic occur in the money market, let a European war break out or a financial crisis occur, the farmer sits secure so far as his board and lodging are concerned, although he may lose his savings. The city worker in almost every capacity is what is delicately termed "retrenched"—that is, cut off from his means of livelihood. But he must feed his family, clothe them, pay his rent and taxes. With no employment, no savings to

fall back upon, what remains for him but debt and the insolvent court when the great financial crash occurs? The farmer can live in his rent-free house, he can live on the produce of his land, on his cattle, sheep, swine, and poultry, and has no difficulty in selling enough produce to procure whatever else he needs, for city people and city horses have to be fed whoever pays for the food, and no one but the farmer can supply it.

It may be said that we paint the state of the farmer in too glowing colours. We only state the bare facts. We have tried it for many years, and, therefore, claim only to state the case as it stands. We merely assert that the farmer can live comfortably in times when a city worker would have to live by his wits. We also maintain that the love of a city life is injurious to the State in two ways at least: First, it robs the farm of its best supports. Secondly, it robs the genuine city worker of his just wage by over-supplying the labour market.

Ne sutor ultra crepidam is a very hackneyed aphorism, but we should like to see the farmers' boys act on it. It means "Let the shoemaker stick to his last." For their benefit we will render it thus: "Let the farmer's son stick to his father's farm."

COTTON IN QUEENSLAND.

Since the Department of Agriculture, in order to stimulate the production of cotton in Queensland, undertook to supply seed to farmers willing to give this crop a trial, and established a cotton ginnery in Brisbane, considerable small areas were planted in various southern districts. The Department, besides supplying seed gratis, undertook to take all cotton delivered at the ginnery in William street, making the growers an advance on their consignments, and handling the product on a co-operative basis, when the season's crop was completed, effected the sale, and merely deducting the ginning, baling, and marketing expenses, divided *pro rata* amongst the suppliers whatever profit resulted from the proceeds.

In 1914, 94,445 lb. of raw cotton were received at the Departmental Ginnery, 524 lb. of which were sent to Panama. The balance, 8,921 lb., was ginned and yielded 2,794 lb. clean lint, which was sold locally at 6d. per lb.

In 1915-16, 29,230 lb. were received, which yielded 10,066 lb. of lint, sold at 7d. per lb.

In 1916-17, 118,229 lb. of farmers' cotton, yielded 37,694 lb. of lint, sold at 11d. per lb.

In 1917-18, 166,458 lb. were supplied by farmers, which returned 54,280 lb. of raw cotton, which was sold in the South at 1s. 1d. per lb. In this year the farmers received 4d. per lb. for their raw cotton, and a further sum for linters, which is the small quantity of short cotton left on the seed after passing through the saw-gin. Last year the Department obtained a machine which saved the fibre on the seed, and which added 2,643 lb. to the total for the year.

In the palmy days of cotton-growing in this State (1866 to 1873), when Queensland exported over 2,500,000 lb. in 1871 to London, the growers were quite satisfied to obtain 3d. per lb. for their raw cotton, and that price gave them a better return than any other crop. Certainly, wages and the cost of living were much lower in those days than at present, but even with labour and rations at their present war prices, 4d. per lb. gives a better return than many other crops, especially as the cotton plant will thrive when those other crops are perishing during a drought.

The following figures show that the cotton industry is steadily increasing, and it is hoped that the rate of progress will be maintained until at least the point has been reached when it will be profitable, provided sufficient protection is afforded, for the manufacture of cotton goods, as is now done with woollen goods.

COMPARATIVE STATEMENT OF COTTON CROPS FROM 1914 TO 1918.

Year.	Total Received. lb.	Lint. lb.	Advance per lb.	Price Realised for Lint per lb.	Received by Farmers per lb. Raw Cotton.
1914 ..	9,445	2,794	1½d.	6d.	1.65d.
1915-16	29,230	10,066	1¾d.	6.9d.	2.54d.
1917 ..	118,229	37,694	1¾d.	11d.	3.5807d.
1918 ..	166,458	54,280	2d.	1s. 1d.	4d.

LUCERNE AND LIME.

A complaint about lucerne plants turning white is answered by a correspondent of American experience, who says:—"We have had similar trouble, and we would advise the cutting of the field and the application of crushed limestone or lime in some form. The lime makes the nitrifying bacteria thrive, and they are unable to exist without it. Explain it as you will, it is our observation that, given the proper soil drainage, lime is the important requisite of lucerne growth. We have noted in our own experience and in that of others that a good vigorous stand of lucerne will be secured, and all at once it will suddenly go back and die out. We have never noted this where lucerne was growing on soil supplied with the requisite amount of lime.

"Crushed limestone or marl can be applied to the field after the first crop of hay is taken off, using from one to two tons per acre, as conditions demand. It is the practice of some successful growers to disc or harrow the lucerne, after the second cutting. The springtooth harrow is used for this purpose. If crushed limestone is applied after the first cutting, it is a good practice to disc or harrow the field of lucerne after the second cutting. It might be all right to cultivate the field after the first cutting, but it is a more common practice to cultivate after the second crop is taken off. The lime can be applied as a top dressing in winter, but the sooner the acid condition of the soil is corrected the better it will be for the lucerne.

"When land is sour an application of lime is indispensable. From one to two tons of crushed limestone, or marl, or thoroughly airslaked lime, may be applied per acre. Owing to the caustic properties of burnt lime we are chary of its use, and much prefer to have it air-slaked before putting it on the land. It is better to apply the lime after ploughing than before. If applied to the land after ploughing, the lime has an opportunity to leach its way through the furrow disc, as the upper portion of the soil is most acid, and, therefore, requires the lime."—"The Leader."

CULTIVATION OF WHEAT.

Mr. B. Jewitt, of Buderim Mountain, writes on the utility of the steam plough in wheat growing:—

"In the year 1869, Fowler's Limited of Leeds, Yorkshire, did their first steam ploughing on Mr. Benjamin Atkinson's farm at Manston Lodge, about six miles east of Leeds. The land to be ploughed was 20 acres in extent, and to be ploughed 14 inches deep, and then to be ripped about with a powerful cultivator, and finally harrowed with very heavy harrows. The contract price for the whole work was £12 per acre. The reason for ploughing so deep was to facilitate drainage, as hitherto the wheat in the same field used to perish during winter owing to insufficient drainage. The field was then sown with wheat in the autumn, and the result was a harvest of 48 bushels per acre. Mr. Jewitt was present at the ploughing, reaping, and threshing."

[As a proof of the value of deep cultivation for drainage the experiment was highly successful. The resulting crop paid about the cost of the work. Were its effects only transient, for one season's crop of 48 bushels of grain, the profit would be nil, but when it is considered that the work would be lasting as a drainage proposition and that subsequent crops of 48 bushels might be obtained under ordinary conditions of cultivation, then it will be found to be a very profitable venture.—Ed. Q.A.J.]

SUGAR-CANE SILAGE PIT.

The General Superintendent of the Bureau of Sugar Experiment Stations says that it may be remembered that some time ago a small silo was instituted at the Sugar Experiment Station, Bundaberg, for the purpose of siloing cane tops. These were gathered in the field immediately after the cane was cut and chaffed up and then trodden well into the underground silage pit. As soon as this was completely filled it was weighted down with earth. After an interval of three or four months this pit has now been opened and a trial made of the silage contained therein. The Chemist in Charge of the Experiment Station (Mr. Pringle) states that the Station horses took very kindly to it when mixed with other feed, but did not care for it alone, while on the other hand cattle took to it at once and eat it greedily.

As there is an immense amount of cane tops usually going to waste in the cane-cutting season, it is evidently quite possible in those sugar-growing districts where mixed farming takes place, to silo cane tops and make use of same for feed at a time when forage is scarce. It may, therefore, be recommended to growers having dairy cattle.

Pastoral.

CONCLUSIONS TO DATE UPON THE EXPERIMENTS BY THE DEPARTMENT OF AGRICULTURE AND STOCK IN RELATION TO THE BEST MEANS TO COPE WITH THE MAGGOT-FLY PEST IN SHEEP.

REPORT BY W. G. BROWN, Inspector in Sheep and Wool, who is in charge of the Experiments.

In accordance with instructions I have the honour to submit herewith some further information *re* the results of five years' experimentation, some conclusions drawn from them, and general experience outside the operations.

Investigation prior to the establishment of experiments at Gindie in 1914.—In January, 1913 (*see* report of Messrs. Cory and Jarvis, October, 1913) it was printed in the "Agricultural Journal of Queensland," p. 5: "If dipping does not altogether prevent the attack of the maggot-fly, it certainly acts in no small measure against that pest. . . . . Once a man dips his sheep he will not require to be compelled, the benefits being so apparent."

Illustrative cases of efficacy of poisonous dips.—In the report of the investigation of 1913 above referred to, Mr. A. H. Cory reported on seven stations.

"No. 1.—Dipped 1,000 maiden ewes, hindquarters only, in Cooper's powder dip (no crutching). Only 12 ewes fly-blown in six months.

"No. 2.—Dipped in June, and up to present (13th October) not 2 per cent. fly-blown. When struck, the maggots did not develop and spread as with non-dipped sheep. Last year 80 per cent. struck.

"No. 3.—Dipped in May; very satisfactory results since. Forty per cent. of sheep were fly-blown last year.

"No. 4.—Dipped hindquarters of ewes in Cooper's five weeks ago. None fly-blown since. Those not dipped have been blown. Marked 1,000 lambs in May, sprayed with Cooper's. Only about 1 per cent. have been blown since, and the lesions did not extend.

"No. 5.—Dipped last four years with six or eight weeks off shears. Particulars (this year?) not available.

"No. 6.—Dipped sheep in May. So far very satisfactory.

"No. 7.—Dipped sheep three months off shears in Royal dip. Ten per cent. affected last year. No flies at present."

Similar cases since October, 1913, can be multiplied by hundreds.

The report from which the above was taken, read in the light of five years of experimentation, is as valuable to-day as when issued. It is on the lines of the recommendations issued that the form of the experiments at Gindie was planned.

As shown in previous reports on the experiments several positive results have emerged, and summarised, they are seen to be—

Efficacy of poisonous dips and dressings.—Generally speaking the specifics used with success are more or less poisonous. One or two used with fair results were non-poisonous and easily soluble in water. The drawback to the use of these seems to me to be that, being easily soluble in water, the tropical rains, which fall so heavily in Queensland at times, are likely to wash them out of the wool, and so leave the sheep unprotected.

Efficacy of crutching and jetting.—Ewes about to lamb, or young ewes with more than six months' wool, are very much more liable to fly-attack than other sheep. In the great majority of cases these animals are attacked at the breach. Hitherto crutching has been the pastoralists' standby.

The benefits of this operation are good for a period, according to the season, of as much as three months, but the knocking about of the sheep, and the large amount of skilled and expensive labour required, has made the method almost impracticable to-day, excepting in small flocks.

Efficacy of jetting with poisonous dips.—There is an alternative which, in my opinion, has proved to be quite as good as crutching, and very much less expensive. That is, the method of jetting a poisonous liquid into the breach of the animals at a pressure of not less than 120 lb. per square inch.

Method of using.—It can be used at intervals of three months. I am of opinion that the cleansing effects of the solid jet is a big factor in preventing fly-attack, this benefit being supplemented by the poison lodged in the wool.

In practice, I find that with a race 3 ft. wide and 50 ft. long, three men can jet about 2,000 sheep per day. There are several effective jetting plants on the market.

Destruction of flies by any means.—It has been urged that if the fly be destroyed there will be no necessity for any of the above measures, and efforts have been and are being made to find a good method of destroying flies.

Traps and poison baits are being tried out with more or less success. It is not possible to kill all sheep flies, but they may be very much lessened in numbers by known means. When they are so lessened, it will give their natural enemies a chance to keep the insects down to normality. Sheep will then be much less liable to fly-attack than in the past ten years.

Natural enemies of flies.—A number of natural enemies may be named—

Birds.—Insectivorous.

Birds.—Carnivorous, such as crows, which devour carrion. It is probable that crows make as much carrion as they eat, especially among weak sheep.

Mice.—In the recent mouse plague, mice cleaned out all the maggots in a dead sheep at Roma which was kept under observation.

The Chalcid wasp. It is only one means of keeping flies in check. Mr. Jarvis's report re discovery of Chalcid wasp.—

Parasites.—These, in the form of a Chalcid wasp, were found in the Longreach district in October, 1913, by Mr. Edmund Jarvis, who stated in his report in December, 1913:—"At Talleyrand I was fortunate in finding unmistakable evidence of the presence of a parasite of C. Rufifacies affecting a large percentage of the pupæ of this fly found in a dead sheep. The carcase was nearly dried up, and all insects emerged, so I collected a few hundred living pupæ and larvæ close to Longreach in the hope that some would be found to be parasitised. On the 29th October scores of hymenopterous parasites, belonging apparently to the Chalcidæ, emerged from these pupæ, all being of the one species—a small shining black wasp 2½ mm. long with legs (excepting femore) and basal joint of antennæ light yellow. Its small size and general structure indicate that it is specially fitted for crawling among wool or other substances in search of its hosts. No secondary parasites have appeared to date."

Chalcid wasp alone is not able to keep flies in check.—There is no doubt, therefore, that the Chalcid wasp is a natural enemy to the sheep fly, yet in the very district where Mr. Jarvis discovered the parasite in 1913 to be numerous and active, up to 80 per cent. of the flocks had been struck by flies. Notwithstanding other claims, this discovery is considered to be the first announcement of the Chalcid wasp parasitising the blowfly. New South Wales is pinning its faith to the action of the Chalcid wasp, but it is considered here to be only one means of many lying ready to hand. Our experiments show that poisonous dips will not only kill the maggot-flies, or rather prevent the maggot from maturing in great numbers, but benefits the fleece in no small measure. This is an outstanding feature of the trials.

Arsenic in its crude form as a dip or dressing.—Arsenic in its crude form as a dip and dressing is coming much into use. Results in the trials are good, especially at Dalmally, Roma. Its use, in my opinion, requires a good deal of experiment yet, not to prove its efficacy as a fly-killer and maggot-killer, these effects are undoubted, but enough is not known as to its effects on the health of the sheep.

Formula of an arsenical dip.—I have a formula which was used in England against the fly for over thirty years, yet on one occasion a large number of sheep were killed by its use. The formula is—

White arsenic, 50 lb.; Caustic soda, 4 lb.; Carbonate of soda, 20 lb.; Soft soap, 35 lb.; Sulphur, 30 lb.; Water, 25 gallons (Concentrate).

Dissolve the arsenic by boiling with alkalies, add the soft soap, and lastly the sulphur. Mix one gallon of this concentrate with 59 gallons water. Dip for one minute.

Arsenical dip not suited for haphazard methods of dipping.—I do not think that crude arsenic as a dip should be used unless with great care and from an experimental view. As a dressing applied to only the breach of a sheep, perhaps it may do no harm, but extended trial is essential. Dipping, as a rule, is carried out in a haphazard method, especially in the admixture and replenishing of the vat with fresh concentrate. Who knows the strength of a dip after a number of sheep have been through it? How much of the solids is taken from it, and how much left in the vat after, say, 500 sheep have gone through? Who ever tries the strength during operations? I have never seen it done, and that is why wool is sometimes damaged and sheep semi-poisoned. Arsenic in its crude form would be much more dangerous than dips from a reliable maker. So many people are using arsenic dissolved with alkalies to-day that I had to take it into consideration. Up to now it has been effective and has not hurt either sheep or wool.

Twice and thrice dipping.—One experiment at Gindie of twice and thrice dipping has shown excellent results. The sheep were dipped in a poisonous dip with two months', six months', and eight months' wool. The broker's report was good as regards the fleece, the sheep came through the fly season well—twenty-nine strikes of fly on individual sheep out of 240 during a period of ten months.

Influence of rainfall on fly.—There is no doubt that the incidence of rainfall governs the activity of the maggot-fly.

Proprietary dips which have been proved effective.—In the last trials the following dips were used and found effective as dips against the fly:—Mallinson's, Quibell's, Royal, Cooper's, Little's (poisonous), Fli-ma-gol (poisonous and oil dip), Kiltick (poisonous).

Are flies local, or do they travel to a bait over great distances?—It has come to be believed by many practical men that flies are very local; that is, they stay where they are bred. It is a common experience to see the sheep in one paddock show a big percentage of fly attack, and in an adjoining one a comparatively low one. This matter is being investigated by a skilled entomologist. Of course, flies will follow sheep into a paddock until they have served the purpose of their being—the perpetuation of their species; but they pick up the flies where flies are principally bred—*i.e.*, camping places, waterholes, shearing-sheds, lamb-marking yards, &c., and so spread them.

No specific has been discovered to prevent sheep from being attacked.—It has been found that up to date nothing has been found, poisonous or non-poisonous, which will prevent flies from striking sheep, although claims have been advanced by many persons that their specifics will *prevent* fly-attack if the sheep be treated with them. This has not been proved in practice. The most that can be expected of any dip or dressing is that when a fly deposits its larvæ on the wool, the maggots will find an uncongenial feeding ground where a dressing or dip has been applied. In illustration:—

Illustrations as to amount of protection.—Some results given by the latest experiments at Gindie and also at Dalmally show, for some of the dips and dressings, that as high a percentage as 32 per cent. of the trial number were struck over a ten months' trial. When the analysis was consulted, however, it was found in one specific case that, of the sixteen sheep (out of fifty) struck, no fewer than ten had been struck by flies at different times, and the affected patch had dried off before the maggots could possibly have matured. In the controls, which were quite untreated, 57.3 were struck at one time or another during the ten months, and showed only two dried off in the same way. This is a striking illustration of the effects of a poisonous dip. It also shows that even the poisoning of wool does not protect a sheep against fly-attack. Sheep dips also benefit the wool. Some of the dressings other than poisonous dips do not.

Inquiry as to the presence of a disease in some years.—A question which is being investigated is:—Why is it that in some years even a slight infestation will cause fever and death in the animal, while in other years (1917 and 1918 to wit) the whole body of the animal may be involved without loss of life? Is it possible that there is a specific organism which is epidemic, or is there a specific fly which is not active in all years?

The influence of ill-health on the incidence of the maggot-fly.—It is undoubted that a sick sheep is far more liable than a healthy one to fly-attack, and for that reason all sick sheep should be isolated from the flock when flies are active.

It is certain that a flock which is suffering from stomach worms, for instance, will have a more serious attack than a sound flock. For that reason sheep suffering from internal parasites should be regularly drenched with the departmental arsenical drench.

Crossbreds much less liable to attack than merinos.—It is certain that crossbreds do not suffer in nearly the same degree as merinos from fly-attack, and wrinkly merinos suffer more than plain-bodied sheep. It seems, therefore, that density of wool to an excessive degree is an inducing cause of fly-attack. Figures are before me which show at Dalmally the order is wrinkly Merino sheep, plain-bodied Merinos, heavy-wooled crossbreds, light-wooled crossbreds, in degree of susceptibility to fly attack.

In regard to sex, maiden ewes, ewes, hogget rams, aged rams, and wethers in that order are susceptible to attack, maiden ewes being the most susceptible in any breed.

Normal seasons when sheep are most liable to fly-attack.—Spring, autumn, wet winters, summer. In dry weather flies are nearly quiescent.

DROUGHT-RESISTING SHEEP.

When the South African Government took over the administration of the South-Western African Protectorate, which first, as German South-West Africa it has conquered, it discovered (writes W. G. Davis in the "Town and Country Journal"), a certain number of Karakul sheep, which the Germans had imported from Asia, finding them entirely suitable for the dry arid lands of their new possession. These sheep are, as far as African experience goes—and those who have seen the Afrikander, the Persian, and the Namaqua sheep living in the desert country of the north-west of the Cape Province, will know the extent of that experience, the finest drought-resisters in the world. Indeed, it is said they can live for a long time on nothing, but, at any rate, they remain alive during a severe drought long after all other sheep are dead. The ewes at such times cannot be expected to rear lambs that will grow into weighty sheep, but, as will presently appear, it is not so heart-breaking to have to cut the throats of the lambs of these sheep as it is of other breeds. However, it is not merely their drought-resisting qualities that make them valuable. They are good mutton sheep, and their hair will bring, at pre-war prices, from 4d. to 5d. per lb., which is not a bad return from animals that will thrive in droughty and barren country. Yet even so, they would not be worth much notice if this was all they had to offer. The real value of them lies in the skins of the lambs, which provide the Astrakan fur, which, at normal times, makes the lamb's pelt as valuable as the whole grown sheep—his mutton and hair together—and it is more than likely that this is a moderate estimate of his value.

Attempts have been made to cross these sheep with the merino, but have failed. Crossings have been more successful with kindred types of sheep, such as are haired instead of woolled. It may be possible to procure and bring to Australia specimens of this breed for trial in Queensland, but not if the South African Government pursues the same conservative policy they did on the exportation of ostriches and Angora sheep. In contrast to their action may be pointed out that of Australia letting high-class merino stud sheep be sold to South Africa for the building up of their merino flocks.

THE MAGGOT-FLY AMONG SHEEP.

Inquiries made from representative Fell-side farmers, owning both mountain and inland flocks, as to the alleged prevalence of maggot-fly to an unusual extent, did not produce corroboration (says the "Yorkshire Post"). It was stated that, so far as farmers on the Cumberland length of the Pennines were concerned, they had not found the plague of maggot-fly worse than usual. There was, however, a remarkable increase in the species of fly which preys chiefly on the heads of sheep, and that is causing great trouble to farmers, and much suffering to the animals. Quite half the sheep in an auction mart ready for slaughter had oiled rags tied about their ears and heads as preventives, and to give relief. A curious feature is that this fly seems to have a special liking for horned sheep. A large Cumberland farmer stated that he had scarcely a horned sheep which had escaped attack.—"Veterinary News," England.

Dairying.

The past season (1918) is to be considered highly favourable from a dairy farmer's point of view. Practically all dairy districts participated in abundant rainfall during the early months of spring, with the result that pastures of a succulent nature were soon in evidence. The dairy herds responded with yields of milk in keeping with the ample supply of grass made available to them, and frequent thunderstorms and general rains maintained the grass lands in a moist condition, and prevented the grasses from wilting until late in the autumn.

The total quantity of milk produced within the year was in excess of that of the former twelve months. No change occurred in the uses to which the milk was diverted, the milk being utilised either for domestic purposes, for the production of butter, conversion into cheese, or for condensing purposes.

In a general sense the industry continues to expand, although, through circumstances incidental to the war, dairying has been confronted with difficulties, and has also enjoyed conditions of a favourable character.

Early in the season a deal of uncertainty prevailed as to whether a satisfactory means could be devised for the disposal or conveyance overseas of the surplus in dairy produce from Australia. The paucity of oversea liners fitted with available refrigerating space was really the dominating factor underlying the position. However, representatives of the various interests connected with the industry in this State, acting in conjunction with others of similar calling in the Southern States, finally arranged a sale of the surplus for the season in both butter and cheese to the Imperial Government, at a price appreciably higher than the average rate prevailing during pre-war years, but at a figure lower than that realised for butters exported during the former season.

One of the conditions of sale provided that payment for dairy produce sold to the Imperial Government was to be made against grade certificates attached to cold store warrant. This proviso overcame a good deal of anxiety that existed concerning the matter of finance of the season's output—a matter of extreme importance in its bearing upon the stability of the industry, as manufacturing companies generally engaged in comparatively large businesses seldom have at command capital adequate to meet the contingency of paying monthly for supplies of milk or cream, unless the companies can in turn realise upon or obtain liberal advances against the manufactured products when placed in cold stores.

The Commonwealth Government acted as agents for the Imperial Government on lines somewhat similar to those under which the Queensland Government had acted for the Imperial authorities in the case of the cheese exported from this State during the former season.

In quality the butter submitted for export was quite equal to that of the previous year. The classification of the butter coming under the notice of the grading officers showed an increase in the percentage of butter worthy of being included in the category of first grade.

The reduction in the number of vessels available for the conveyance of butter overseas led to quantities of butter being held in cold stores here for comparatively lengthy periods prior to exportation. This, in turn, caused congestion, and the cold storage space ordinarily at the disposal of shippers of dairy produce was insufficient to meet the demands made upon it. Fortunately for the industry, it so happened that the export season for meat opened much later than customary, and by this means it became possible to arrange temporarily for the cold storage of a large quantity of dairy produce in the refrigerated chambers of a conveniently situated meatworks, and the flush of the dairy season was over before the use of these cold chambers had to be relinquished. Each year continues to furnish a demonstration of the inadequate cold storage provisions now existing at this port, and, as stressed in previous reports, the provision of additional cold storage accommodation for dairy produce is necessary for the welfare and expansion of the dairy industry.

Towards the end of the season a considerable amount of cold-stored butter was released for shipment to Southern States, and as cold storage space was not available upon the coastal steamers, the butter had of necessity to be carried as ordinary cargo, and when exposed to such unsatisfactory conditions in transit, the delicate and highly perishable nature of butter asserted itself, and as a consequence, complaint was raised as to the quality and condition of some of the butters consigned interstate. These butters were drawn from the "butter pool," and neither the vendors nor those to whom the butter was supplied, were prepared to recognise that deterioration in the quality of the product was inevitable under the extraordinary conditions under which the butters were shipped. For several years past a similarly unsatisfactory state of affairs has enveloped the interstate trade in Queensland butter, and there will be a continuance of the trouble until a normal shipping service is restored. Frequent attempts have been made to place the responsibility of the deterioration in quality upon the shoulders of those who primarily carried out the classification of the butter upon entrance into cold store, rather than ascribe the reduction in quality of the butters consigned interstate to the obvious cause. In innumerable instances, the unshipped balances of similar brands of butter to those consigned interstate have been examined and check-graded, and invariably the result has been that the butters treated as the nature of the product demands were found to be of the quality indicated by the class-mark affixed by the examining officer.

THE USE OF LIQUID MANURE AND HOW TO PREPARE IT.

By K. J. A. SYLVA, in "Journal of the Ceylon Agricultural Society."

The use of liquid manure is of special importance in gardens, especially the section devoted to vegetable-growing, and every gardener should be taught how to prepare and apply it. A natural and very effective liquid manure consists of the drainings of cattle sheds, stables, dung heaps, etc. Such drainings should, however, be diluted, according to strength, before application.

Liquid manure has special advantages for garden crops, its stimulating effect on which being generally very noticeable. The fertilising ingredients of a manure can generally be absorbed by growing plants more readily in a liquid than in a solid form. Manure in a solid state can be applied to the soil before the seeds are sown or seedlings planted, but subsequently it cannot be dug into the soil without some interference with the roots of the growing crop, even in the case of well-established plants. It is partly on this account that liquid manure is so valuable.

For pot plants and flower beds I have found liquid manure has very beneficial effects on the plants and flowers. The solid manure originally applied to the soil gets in time exhausted by the growing plant and it is at this stage that more nourishment is required, the soil becoming poor and incapable of maintaining the plant in a healthy and vigorous state. Liquid manure, which is easily applied, comes to the rescue and remedies the defect.

In the cultivation of celery, rhubarb, cucumber, tomatoes, balsam, gloxinias, begonias, salvias, &c., liquid manure has been used with excellent results. In short, all flower-plants, vegetable crops of a quick-growing nature, and pot-plants of all kinds require treatment with liquid manure to ensure the best results being obtained.

MODE OF PREPARATION.

There are two methods of preparing liquid manure:—(1) Take a bucket of liquid drainings from the manure pit and mix it with twice its quantity of water and apply on the following morning, after allowing the sediment to settle down. During wet weather the dung heap drainings may possibly be applied with safety without further diluting. (2) Put a bucketful of fresh cattle dung in a jute hessian bag and place it in a large tub containing six buckets of water, and stir well with a stick two or three times a day for about four days. Let it settle, and, when clear, dilute once more with six buckets of water; there will then be no coarse sediment to soil the foliage or blossoms, the efficacy remaining unimpaired. It is a very safe method to water the plant with manure water and pure water alternately.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1918.

The laying for the month of December has been very unsettled. Up to the 20th very poor work has been done in the case of a large number of pens, but during the last eleven days a marked increase took place. The weather has been exceptionally trying, hot days prevailing throughout the month, which have found out the weak points in a number of the birds. Taken on the whole, the birds are looking well, and the hot weather has not had the bad effect one would expect in their appetites. A. E. Walter's F bird produced the possible for the 31 days; while D. Fulton's A hen completed a fine continuous run of 74 days in succession on the 15th of the month. No deaths have occurred, and only one bird has been removed from its pen for sickness. Broodies have not been quite so plentiful, and it is satisfactory to note the short time it has taken the birds to come on to lay after leaving the broody coop. The following are the individual records:—

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns	120	1,257
*G. W. Hindes	Do.	127	1,179
*E. Chester	Do.	124	1,173
*Tom Fanning	Do.	126	1,118
*C. P. Buchanan	Do.	116	1,105
*W. Becker	Do.	120	1,104
*G. H. Turner	Do.	109	1,093
*Geo. Prince	Do.	104	1,093
*G. Howard	Do.	106	1,081
*Mrs. L. Henderson	Do.	113	1,073
*W. Lyell	Do.	118	1,070
*E. A. Smith	Do.	103	1,046
*L. G. Innes	Do.	104	1,034
*Oakland Poultry Farm	Do.	95	1,033
*R. Holmes	Do.	104	1,028
*C. Knoblauch	Do.	79	1,024
*Dr. E. C. Jennings	Do.	119	1,015
B. Caswell	Do.	114	999
*O.K. Poultry Yards	Do.	104	998
*Quinn's Post Poultry Farm	Do.	108	989
*Range Poultry Farm	Do.	108	979
*Thos. Taylor	Do.	126	977
J. J. Davies	Do.	118	976
Harold Fraser	Do.	119	954
*Mrs. A. T. Coomber	Do.	104	944
*Homalayan Poultry Farm	Do.	109	925

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS—*continued.*			
*J. M. Manson	White Leghorns ...	111	920
*J. Zahl	Do.	92	895
Mrs. L. F. Anderson	Do.	120	895
*Mrs. R. Hunter	Do.	121	887
Mrs. A. G. Kurth	Do.	127	881
*C. Porter	Do.	82	878
O. W. J. Whitman	Do.	102	874
*T. B. Hawkins	Do.	123	847
Geo. Trapp	Do.	125	840
*J. W. Newton	Do.	92	832
S. Wilkinson	Do.	106	832
Shaw and Stevenson	Black Leghorns	108	829
H. B. Stephens	White Leghorns ...	102	829
Progressive Poultry Pens	Do.	128	814
G. Williams	Do.	112	812
H. F. Britten	Do.	103	806
B. Chester	Do.	126	799
R. T. G. Carey	Do.	84	794
P. O. Oldham	Do.	121	787
W. A. Wilson	Do.	126	752
A. W. Walker	Do.	117	720
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons ...	105	1,120
*D. Fulton	Do.	116	1,024
*A. E. Walters	Do.	99	995
*R. Burns	Do.	112	991
*E. Morris	Do.	85	988
T. Hindley	Do.	103	974
*E. F. Dennis	Do.	66	954
*Mars Poultry Farm	Do.	89	932
*W. H. Reilly	Chinese Langshans ...	106	906
*W. Smith	Black Orpingtons ...	104	906
A. Shanks	Do.	106	883
E. M. Larsen	Do.	101	859
*J. W. Macrae	Do.	78	854
T. W. Lutze	Do.	109	822
*F. A. Claussen	Rhode Island Reds ...	89	712
W. J. Mee	Black Orpingtons ...	51	666
H. Puff	Rhode Island Reds ...	85	643
Jas. Fitzpatrick	Do.	103	642
Totals	...	6,932	60,671

* Indicates that the pen is engaged in single hen test competition.

RESULTS OF SINGLE HEN TESTS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	189	204	228	194	211	231	1,257
G. W. Hindes	228	195	183	200	193	180	1,179
E. Chester	204	194	183	213	193	186	1,173
T. Fanning	197	175	204	149	198	195	1,118
C. P. Buchanan	166	187	186	186	197	183	1,105

RESULTS OF SINGLE HEN TESTS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued.*							
W. Becker	186	188	165	202	168	195	1,104
G. H. Turner	127	147	203	196	231	189	1,093
Geo. Prince	164	199	175	198	176	181	1,093
Geo. Howard	172	176	188	200	168	177	1,081
Mrs. L. Henderson	186	161	183	147	203	193	1,073
W. Lyell	175	194	192	171	170	168	1,070
E. A. Smith	154	200	183	167	185	157	1,046
L. G. Innes	186	196	223	117	127	185	1,034
Oakland Poultry Farm	150	173	185	183	175	167	1,033
R. Holmes	184	188	161	168	154	173	1,028
C. Knoblauch	186	163	191	165	144	175	1,024
Dr. E. C. Jennings	149	211	180	153	175	147	1,015
O.K. Poultry Yards	150	180	187	149	179	153	998
Quinn's Post Poultry Farm ...	198	153	153	135	196	154	989
Range Poultry Farm	91	203	146	181	176	182	979
Thos. Taylor	135	177	167	151	172	175	977
Mrs. A. T. Coomber	144	182	157	167	120	174	944
Homalayan Poultry Farm ...	183	156	140	130	169	147	925
J. M. Manson	193	167	186	128	112	134	920
J. Zahl	186	146	171	166	134	92	895
Mrs. R. Hunter	138	163	95	149	172	170	887
C. Porter	130	151	155	155	110	177	878
T. B. Hawkins	169	125	161	133	126	133	847
J. W. Newton	162	188	97	115	153	117	832
HEAVY BREEDS.							
Nobby Poultry Farm	217	193	175	113	207	215	1,120
D. Fulton	207	157	158	160	128	214	1,024
A. E. Walters	140	190	131	187	180	167	995
R. Burns	148	172	141	155	214	161	991
E. Morris	142	154	179	196	179	138	988
E. F. Dennis	191	141	159	103	188	172	954
Mars Poultry Farm	167	176	144	161	140	144	932
W. H. Reilly	160	162	154	115	133	182	906
W. Smith	211	158	100	144	132	161	906
J. W. Macrae	104	121	158	141	167	163	854
F. A. Claussen	123	120	116	128	132	93	712

DOES POULTRY FARMING PAY.

By A. V. D. RINTOUL, Assistant Poultry Expert, Victoria.

The fact that this question has appeared at some time or other in most poultry journals published in every corner of the globe is, of itself, sufficient reason why a careful analysis of the prospects of the industry is, at this crisis in the world's history, eminently desirable. Primary production must form the basis of our future success, and no nation can afford to neglect any branch of the rural industries in which profits may accrue.

It is desirable, in the first instance, to determine what is actually meant by the term "Poultry farming." The main source of income undoubtedly should be derived from the production of eggs for commercial purposes, and while this end is being achieved considerable profits may at times be made by those meeting the requirements of certain branches of the industry, but these side-lines must remain permanently subsidiary to the determining point—Does egg production pay? Failures must be accounted for more fully than successes require to be. Considerably more than a competence is gained by those engaged in the following branches:—Stud breeding

(which includes the sale of baby chicks, &c.), custom hatching, the sale of proprietary foodstuffs, the manufacture of articles of equipment, such as incubators, brooders, and the like, literary work in connection with the industry, and lastly—though none too remunerative—instructional and advisory work. All these sources of income are, however, in the long run dependent upon the success or otherwise of the endeavour to produce commercial eggs profitably. Failures are all too frequent, and their causes and methods of prevention are therefore entitled to a close analysis.

Failures are almost invariably due to one or more of the following causes:—First and most important, *lack of experience;* second, *lack of capital;* third, *lack of health;* and a fourth cause may be added, lack of aptitude for the business. Quite recently a well-known institution desired to have one in whom it was interested started in poultry keeping, largely on the ground that the mentality of the individual concerned was too low to permit him to take up any other work. No greater mistake could be made than to consider poultry keeping the proper outlet for the fool of the family. Apart from the aptitude to carry on any commercial undertaking successfully, there is required an ingrained love of live stock with the ability to get the best return from them, besides a general knowledge of food values, building construction, bookkeeping, and banking, together with some elementary anatomical and medical experience.

Lack of experience in any of these matters may prove the poultry-keeper's undoing, yet, fired with enthusiasm, which is perhaps a polite way of expressing "through foolhardiness," the beginner rushes in, and may be, owing to the blandishments of some agent, buys land in an unfavourable situation, proceeds to erect unsuitable housing, acquires stock from an undesirable breeder, or makes a start at the wrong time of the year. Failure results, but this does not mean that the query, "Does poultry farming pay?" is to be answered in the negative.

Lack of capital is the next barrier to success. The land may be suitable, the shedding correct, the stock of high quality, but the available funds are insufficient to tide over the necessary period until enough stock come into full lay at the right time of year to more than balance the ledger. This want of sufficient capital also prevents the best being got from the undertaking, as suitable lines of foodstuffs cannot be purchased under the best market conditions; young cockerels are sold too soon owing to the lack of capital for foodstuffs, or in consequence of insufficient shed accommodation to enable them to be held pending the time of most advantageous marketing; eggs have to be disposed of for cash as laid instead of being held in cool store until the dearer time of year.

Lack of health is perhaps the most tragic cause of failure, those who are compelled on this account to lead an out-door life finding that at certain times of the year the work is more arduous than they are, by nature of their ailment, able to perform.

We now arrive at the point where the question can be put—Given sufficient experience, the necessary capital, and good personal health, does poultry farming pay? To this there can be only one answer, "Yes, it undoubtedly does." As to how the capital and good health may be acquired is not a direct concern of the Department of Agriculture, but the necessary experience can undoubtedly be gained by spending at least six months, and preferably a year, at some place where the business is already being made a success, and, unless a business is a success commercially, there is some element of doubt as to which is actually meant by the term "taking in" students.

What Profits can be Made.

On this point there is a wide divergence of opinion, and because a certain profit per head can be made from 20, or even 200, birds, it by no means necessarily follows that proportionate results will be obtained from 2,000 or 20,000 birds. Estimates are almost invariably based on the returns from the sale of eggs, less the cost of feed, more or less neglecting the rental value of the land, interest and depreciation on buildings and equipment, and the labour involved.

A careful study of the egg-laying competitions during the past few years reveals the fact that it is possible to get a return of seventeen dozen (204) eggs per bird in a period of twelve months from 600 or more pullets, and that these eggs are worth, on an average, 1s. 2d. per dozen all the year round, so that the competition income per bird may be stated, roughly, at 19s. 4d., against an average cost of feed—in war time—of about 9s. 4d. Consequently, the competition profit over feed has been about 10s. per head, but it would be fatal to consider such return as net profit on a commercial plant. Whatever may be the circumstances of the selection of competition birds, they undoubtedly are considered at the time to be the pick of the flock, and not representing the general average. Further, no account is taken of the cost

of rearing a pullet up to the time she arrives at the competition, from which it may be seen that an estimate of 20s. profit over the feed bill *for the laying year* for every three pullets—*i.e.*, 6s. 8d. each, is much more nearly correct than to foolishly expect 10s. per bird. Even this 6s. 8d. per bird, however, is not net profit, because the cost of rearing to the laying stage usually exceeds the market value of the light-breed birth after her laying year, and no allowance has been made for interest on capital expended on house, land, shedding, and equipment, nor, in the case of light breeds, for the cockerels, which at times fail to realise the actual expenditure upon them. Probably, therefore, it is much more reasonable to assess the real profits at 5s. per bird over the entire flock.

This estimate will eventually prove of greater value to the industry than any higher one that could be made, as it should not only act as a wholesome check upon the inexperienced speculator, who is easily carried away by incorrectly worded pamphlets, but also act as an inducement to everyone to keep, at least, a few fowls, if only for the profitable nature of this undertaking. The suburban dweller using household scraps can materially reduce the feed bill thereby, and no farm should ever be considered complete without, at least, 100 or 150 fowls. There are a large number of suburban homes which are actually being paid for by the profits made from poultry, while the wages earned are meeting household expenses.

When the United States of America declared war, the sum of £30,000 was at once appropriated for itinerant lecturers to develop the poultry industry alone, which was then worth £140,000,000 per year, or, roughly, £1 8s. per head of population. In Victoria, the industry is worth about £2,146,000, or, roughly, £1 10s. per head of the population, and the expenses connected with the industry have been drastically curtailed since the war.

SEPARATION OF THE SEXES.

A point on which every stress should be laid—the separation of the sexes. Infertile eggs are the foundation of the market egg trade, and if all eggs marketed were non-fertilised, our egg production would increase in value from 10 to 25 per cent. Again, no bird will reach the utmost perfection in size and vigour unless separated from those of the opposite sex at an early age. No cockerel will be half so good for table if allowed to run with females as if separated when young. Separate the sexes and reap the full benefit of your labour and feed outlay.

We may be accused of promoting production at the expense of sales of the poultry raised. It is not true. If all the stock raised were of prime quality, our markets would be fairly well supplied.—"Garden and Field."

RECORD PRICES FOR FARM PRODUCE.

The second week in January was notable for the number of records broken. Each morning saw fresh records at the Brisbane Produce Markets. The majority of the farmers are losing heavily by the drought, but a few fortunate ones are reaping large profits. One truckload of lucerne chaff was sold for the record price of £150 at one day's sale, while other sales were made in proportion. The top price was 17s. 4d. per cwt., secured for a choice line from Harrisville, while another nice line from that centre changed hands at 17s. 1d., Laidley chaff bringing 17s., and other sales being effected at prices ranging from 16s. 1d. to 16s. 9d. Every line submitted was sold out. These prices are approximately £1 per ton above those of the previous day. Mixed chaff rose about 10s. per cwt., a line from Wilson's Plains being disposed of at 14s. 6d. per cwt. Lucerne hay was passed in at an offer of 11s. 6d. per cwt., and a line of onions from Forest Hill fetched 12s. 6d. per cwt. Oaten chaff was firm, and medium quality stuff was disposed of at 10s. 7d. and 10s. 8d. per cwt., one line being passed in at 10s. Maize advanced a further half-penny per bushel, the only line submitted being sold at auction at 8s. per bushel. About ten other truckloads were in the market, but these were either sold privately or put into store. A new record for potatoes was established, prime tubers from Killarney realising 32s. per cwt., and a lot from Summit 30s. Inferior, small potatoes were knocked down at an offer of 15s. 9d. On the following day, potatoes were sold at 34s. per cwt.

Horticulture.

TO AID THE AMATEUR GARDENER.

The following useful notes on gardening were published in the Brisbane "Daily Mail" of 11th January, and are well worth noting by amateur gardeners:—

In the cooler parts of the State there may be sown this month—pansies, sweet peas, stock, candytuft, mignonette, poppies, dianthus, anemones.

In the coastal districts—asters, balsams, celosias, salpiglossis, amaranthus, portulaca, marigolds, salvia, zinnias, coreopsis.

For pot culture—primula, St. Paulia, cinerarias, gesneria, schizanthus, streptocarpus.

In the vegetable garden—cucumbers, cauliflowers, cabbages, silver beet, marrows, pumpkins, tomatoes, kohl rabi, lettuce, beetroot, lima beans, squashes.

This is cheerful weather in which to write about gardening. The lawns will keep brown and the aster beds will demand constant watering. Lettuces refuse to do anything but run to seed, and one must have the patience of a Chinaman to produce beetroot and tomatoes for the clamouring cook. But enemies keep the amateur from getting fat. If he had no Water Board that cut off his supply from 3 p.m. till 9 p.m.; if he had no scorching sun; if he had no pumpkin beetles and no cabbage grubs, life would become too easy for him, and he would have to throw up gardening for some more vigorous game like bowls. Let us be thankful, therefore, that we have our enemies.

Let us show that we know how to get flowers in drought time by sowing more salpiglossis and more calliopsis and more zinnias. If these be sown now they will make gay the garden for the balance of summer. Portulaca thrives on little water, but asters, amaranths, and celosias demand much of it. Without an abundance of water and a rich soil, asters will come to nothing, but give them a soil that is full of humus, deep, cool, and moist, and they will give generously of their beauty. This writer has two large beds of asters at the present time. One is gay with the finest blooms he has ever grown; the other is a disappointment and an ugly jest. The difference has origin in about six barrow-loads of cow manure that were dug into the good bed somewhere about last June.

Preparation is the thing. Thinking and working ahead bring results in gardening.

It is not too early to think of the sweet peas that are to be grown. In the cooler parts of the State sweet peas may be sown at the end of this month; so may stocks, candytuft, dianthus, mignonette, poppies, and such bulbs as the anemones and ranunculi. Toowoomba and Downs gardeners get ahead of us in this respect, and, to give them the praise to which they are entitled, they make the most of their opportunities. There are some great amateurs west of the Range.

Down on the coast we must wait a while before we sow sweet peas, but we can get the ground ready. We can make the trenches and fill them with the manure that is to put four blooms on each stem, and make the stems twelve inches long. Beds must be prepared for stocks, and they, too, must be rich. What is the use of gardening at all unless it be done well? What is the use of growing scraggy things, when high-class blooms may be produced? What is the use of growing miserable vegetables, such as can be bought from the corner shop, when it is possible to grow toothsome vegetables, that will bring father home to dinner regularly every night? Rich soil, good drainage, ample water—these are the needs.

We could say these things over and over again—rich soil and ample water—and three parts of the amateur gardeners would keep on growing plants in poor, gravelly soil with a minimum of moisture. Why? Rich soil is within everyone's reach. The poorest soil may be made rich. Cowpeas grown on it and dug in will add humus and nitrogen. Seedsmen will supply superphosphate. The leaves that are gathered around the garden, much of the kitchen refuse, will add humus. It may be possible to add stable manure in plenty. Even the refuse from the tanneries, if well rotted, provides the humus to turn poor soil into soil that is possible for gardening.

The first need, therefore, in planning an autumn garden is to prepare the soil in advance. When that is done we shall be ready with ideas as to how it should be planted.

Tropical Industries.

THE CASTOR OIL PLANT.

From reports received from different parts of the world, there would appear to be a strong movement in various agricultural districts in favour of the cultivation of the castor oil plant, and apparently the matter has been taken up by the Advisory Council of Science and Industry, in Melbourne. The Council received a letter in September last year from Mr. Daniel Jones, Brisbane, on the subject, and also some seeds of the Eureka castor plant. This letter and the seed were handed to the Lycett Proprietary Company, Limited, in Melbourne, where the seed was tested in the laboratory, and Mr. Jones received the following letter from the firm:—

"30th October, 1918.

"Dear Sir,—The Advisory Council of Science and Industry, of Melbourne, have handed to us a copy of your letter, dated 11th September, to Dr. H. C. Richards, Bureau of Science and Industry, Brisbane, together with sample of Eureka castor seed. We have read your letter with interest, and have had the sample of seed tested in the laboratory.

"We note that you submitted a sample of this seed for analysis in Brisbane last year, and the result given was 59 per cent. of oil. This is indeed a very high percentage, and the seed would be worth the top market value. A test of the seed which we have put through in Melbourne shows that the seed contains only 45.9 per cent. of oil, but at the same time we would say that when the seed reached us same appeared to be in a very dry condition, and, perhaps, it was very old. The result of 45.9 per cent. in the laboratory test is not very good, and a good seed which can be worked profitably should always show over 50 per cent. of oil in the laboratory test. Apart from this the oil obtained from the seed seems to be of excellent quality, having an acid value of only .09 per cent. The value of this seed, c.i.f.e. Melbourne, to-day would be about £20 per ton, and we will be prepared to pay this price for any quantity that can be obtained for us in Queensland, provided same is delivered before the end of the first six months of next year.

"We are sending you per even mail a sample of castor seed which we are at present working on and which is obtained from India, and also a sample of castor seed which we have been in the habit of using and which has been obtained from Java.

"Yours faithfully, LYCETT PROPTY., LTD.

"30th October, 1918."

In August, 1918, the "Agricultural News," Barbados, published a very interesting address on the subject, delivered on 2nd August by Mr. A. E. Collens, Superintendent of Agriculture for the Leeward Island, to the Antigua Agricultural and Commercial Society, much of which is here reproduced, under the title of

THE CULTIVATION OF THE CASTOR OIL PLANT AND THE PREPARATION OF THE OIL.

According to DeCandolle, in his book "The Origin of Cultivated Plants," the castor oil plant is a native of Africa, although it is now naturalised throughout the tropics.

The oil has been employed for various purposes from the earliest times. It is especially valuable at present as a lubricant for fast moving machinery, particularly for aeroplane motors, owing to the fact that it is unaffected by a wide range of temperature.

The medicinal use of the oil is well known, but it is also valued in India as an illuminant, burning with a minimum production of soot. It is also used in leather dressing and for fixing alizarine red in the dying of cotton.

The leaves of the plant are employed in rearing a certain type of silk-worm in India, and recently attention has been paid to this matter in Trinidad. The leaves are also fed to cattle in India, and are said to make excellent forage.

With regard to cultivation, castor seed requires much the same attention and cultural methods as cotton. It thrives best on a rich, well-drained, sandy loam, and will not do well on heavy wet soils, or ill-drained, swampy lands. The root penetrates deeply, and therefore the land requires to be deeply ploughed and well worked.

Castor seeds have an extraordinary vitality; seeds known to have been kept for fifteen years in a stoppered bottle have been sown in Queensland, and have produced healthy plants.

Under normal conditions germination is slow, and the seeds when sown may take a more or less prolonged time to germinate. In modern practice it is advocated that the seeds should be softened by having hot water (almost boiling) poured over them, and being left to soak for twenty-four hours before planting.

The seeds are usually planted 6 feet apart each way, three or four seeds in a hole. They usually germinate within ten days. When the plants are 8 to 10 inches high they are thinned out to one stem in each hole. In the experiments in Antigua the seeds were planted 4 feet by 5 feet. If extensive cultivation is undertaken, a space should be left every eighth row, to allow for the passage of a wagon or cart to collect the seed in harvesting. About 8 lb. to 10 lb. of seed are required per acre.

In from three to four months the plants commence to bear, and will continue in bearing for at least three months. In the tropics the castor plant is a perennial, but it is questionable whether under cultivation it is desirable to allow the plant to continue growing after six months. As the plant ages it is liable to be attacked by scale insects, and apart from that, the difficulty of gathering the crop, and the diminished yield indicate that at the end of six months it should be ploughed up. If left alone, the plant would grow to an inconvenient height. It should therefore be topped by pinching back the main stem when the plant is about 2 feet high; this will cause the plant to throw out more fruit spikes. When the capsules turn brown it is time to harvest the seed. This is done by cutting off the spikes, and removing them to a barn to dry. The seeds should not ordinarily be allowed to dry on the plant, as in some varieties the pods are very apt to burst open automatically.

Several methods are adopted for removing the woody capsule.

In the United States the spikes are spread out on a drying ground to a depth of 6 inches or 1 foot, according to the weather. This drying ground may be either covered or open; the floor should be clean swept or boarded; and it should have a low wall or fence to prevent the seeds from scattering when the capsules burst. If out of doors, means should be available for protecting them from the weather, *e.g.*, by drawing them into heaps and covering them if rain threatens.

The spikes should be turned over frequently in the sun; the capsules soon burst, and in four or five days they will have shed their seed. The seed is then winnowed free from the husks.

In the Bengal gaols the splitting of the shell is done with a machine, which consists of two smooth iron rollers about 2 feet long, placed parallel to one another, and working towards one another by a simple arrangement of cog wheels. One of the cylinders or rollers is fixed, the other movable by a screw adjustment. By means of the latter contrivance the space between the cylinders can be regulated to the required distance, the space being increased or diminished according to the size of the seed about to be split. The great point is to give the seed sufficient squeeze so as to split the shell without crushing the kernel. The seed can then be winnowed by hand or by a mechanical shaker.

Mr. Archibald Spooner, several years ago, while in Antigua, experimented in castor oil cultivation and devised a machine with a knapping action, consisting of two horizontal superimposed wooden discs; the top of one was fixed and the lower one revolved. The capsules were fed in on the centre, and travelled along grooves until they finally came in contact with the fixed top disc, when the knapping action caused them to split open.

The yield per acre varies with the different kinds of seeds, and also with the type of land. In Madras, where over 500,000 acres are planted in this crop, the normal return in dry lands is 200 lb. to 300 lb. per acre, while in more favoured localities up to 700 lb. are obtained. In Texas and Florida yields as high as 2,700 lb. per acre are stated to be obtained, while the average yield in the United States varies from 700 lb. to 1,600 lb. per acre. In Colombia 2 lb. per plant is stated to be the average yield, which appears to be somewhat high; 1 lb. of dried seed per plant being nearer the usual quantity.

The following table represents some yields obtained in the Leeward Islands in recent years:—

CALCULATED YIELDS PER ACRE.

Variety.	Antigua.			Nevis.
	1911.	1912.	1913-14.	1917.
	lb.	lb.	lb.	lb.
Ricinus communis (major)	—	—	—	550
Ricinus communis (minor)	—	—	—	460
Zanzibarensis	980	390	1,040	650
Native large	—	—	—	780
Native small	—	—	—	475
3172	1,280	450	400	
3173	—	420	560	
3175	900	—	—	
3176	780	330	460	

The yield varies greatly, but this may be partly due to seasonal changes. The rainfall in 1912, for example, was abnormally low, the average being 32 inches, as against a normal average of 45 inches for forty-four years.

Two types of seeds, large and small, are met with usually in commerce. The large type yields a slightly larger percentage of oil, but the oil extracted from the smaller type is considered more valuable, and is especially used for medicinal purposes.

Recent examinations in the Government Laboratory, Antigua, of types of castor seed obtained locally, indicate the following oil contents in the whole seed (unshelled):—

	Percentage of oil.
Small local type	49.0
Large white, slightly speckled seed	56.5
Large Ricinus Zanzibarensis	55.2
Large Communis major (brown speckled seed)	55.8

Castor oil requires considerable purification after expression to free it of albuminous compounds, gummy substances, &c. The following is a crude method which is sometimes employed in these islands. The seed is heated in a pot, and then pounded in a mortar. The pounded mass is then placed in boiling water, and well stirred till the oil rises and is skimmed off; a fresh supply of boiling water is then added, and it is boiled for the second time to recover any remnants of the oil. The oil is then boiled to evaporate any water it contains. This also helps to volatilise acrid principles. The pan is at once removed from the fire when the last drop of water has been evaporated, so as to prevent scorching or burning of the oil.

In the United States the seeds are cleaned from fragments of capsules, &c., but are not decorticated like cotton seed, nor crushed between rollers as are most oil seeds, but pressed whole. The usual process is to express the oil cold, by gradual pressure under a powerful hydraulic press. In the United States of America single pressing is generally used, the cake being trimmed, and the edges re-pressed with fresh seed.

The oil as it flows from the press is a whitish liquid containing starch, albumen, and mucilage, which are subsequently separated by careful clarifying and refining.

In the United States of America 32 per cent. is the average amount of oil expressed from the seeds, the beans containing a total of 45 per cent.

In England the industry is chiefly centred at Hull, where, after cleaning, the hulls are removed by a slight crushing, and the seeds pulped. The oil is then expressed in hydraulic presses, and afterwards refined with fuller's earth and filtered through a filter press. The press cakes are afterwards steamed and re-pressed, and yield a lower grade of oil.

An interesting feature to West Indian planters is the experimental trial in India of the Anderson Oil Expeller, a type of oil extractor which has been recently erected in S. Vincent, and which has been found to give excellent results in the manufacture of cotton-seed oil in that colony. Trials with the Anderson Expeller in Mysore in 1915 gave a yield of 44.3 per cent. with seed containing 47.2 per cent. of oil, the residual cake containing 5.05 per cent. oil, which is considerably less than with other types of presses.

The principal by-product of the industry is the castor cake or pomace; this has no feeding value owing to noxious substances contained in it, and is only used as a fertiliser. The toxicity of the cake is due to the presence of a poisonous nitrogenous principle, ricin, which is not an alkaloid, but belongs to a class of unorganised chemical ferments termed phytalbumoses. Ricin is extremely poisonous, 9.3 milligrammes (.14322 grain) will kill a dog. Curiously enough, fowls are fairly resistant to this poison, and castor cake can, to a certain extent, be fed to them with impunity. Researches are being made in methods of removing this toxin by treatment with high pressure steam. As a fertiliser, however, the pomace is highly valued, and is largely used in India.

In India the greater bulk of the Madras output of pomace, some 80,000 cwt. in 1914-5, is shipped to Ceylon, to be used as a fertiliser, and fetched from 75s. to 100s. per ton in 1916. Its present value in Great Britain is £16 per ton.

In connection with the recent boom in castor seed production, it may be noted that over 50,000,000 lb. of seed were imported into the United States of America in 1916. With regard to West Indian and South American exports, Puerto Cabello in Venezuela exported 185,463 lb. in 1917, and recently Colombia sent two shipments of 62,000 lb. of seed to the United States. A contract of 500,000 bushels (roughly 25,000,000 lb.) of seed was placed by the United States Government with a local firm in San Domingo in 1917.

In London, February, 1918, the price of castor oil was £80 per ton (about 9d. per gallon), and of castor seed £37 per ton (about 4d. per lb.). In the United States of America the price in New York, June, 1918, for castor oil was 29c. to 33c. per lb., as compared with 9c. to 11c. per lb. in 1904.

A cable message was received from India on 29th July to the effect that the Indian Government had prohibited the exportation of castor oil. This will mean that the already restricted supply of castor oil will be still more restricted, and the price will rise to a very much higher figure than at present.

These seeds were given to us by the late Government Botanist, Brisbane, Mr. F. M. Bailey, and on being planted in poor soil near Brisbane, germinated and developed into fine healthy plants over 10 feet in height, which produced a heavy crop of seed. Later on, the spikes were attacked by some insect pest, and were totally destroyed. Ed. Q. A. Journal.

COCO-NUTS *OR* RUBBER—WHY NOT *AND* RUBBER?

A question that is now receiving very serious consideration, the "Indian Planters' Gazette" tells us, is whether coco-nut or rubber planting is more profitable. A few years ago, during the great rubber boom, rubber appeared to be more favourable than coco-nuts, but with the depletion of the world's supply of fats the position has been reversed, and the general opinion is that coco-nuts will, when shipping is more normal, become a profitable investment. There is no lack of demand for the product, and the price in London is about £45 per ton, against £90 or £92 at Marseilles. In view of the altered circumstances, some rubber companies are seriously contemplating the substitution of coco-nuts, and it will not be a surprise if very shortly we have a great coco-nut boom. The many uses of this palm and its by-products are safe guarantees of the great future before the industry. All the same, we (*i.e.*, "Tropical Life") have no hesitation in saying that he will be an extremely foolish man who would cut out well established rubber even for possibly equally remunerative coco-nuts. "A bird in the hand, &c." Because markets drag now that does not mean that they will always do so. On the contrary, the very causes that are damming up the demand and keeping down prices for raw rubber now will cause the sluice gates of the world-demand to swing open all the wider when the war is over, and, *above all*, rubber estate owners must remember that, whilst coco-nut planters have several rivals in palm oil, ground-nut, soya oil, &c., Hevea rubber stands alone, and always will do. Plant coco-nuts, therefore, as much as you like, and so have a second string to your bow; that is good business, but to talk of cutting out good rubber . . . . . But maybe it is not good rubber, nor a good manager either, and in that case, of course, we do not want to meddle.—"Tropical Life."

Animal Pathology.

REPORT ON MR. MUNRO HULL'S CLAIMS REGARDING TICK-RESISTING CATTLE.

The following was inadvertently omitted as an appendix to Mr. C. J. Pound's comments in last month's Agricultural Journal:—

ANSWERS TO THE 25 CLAIMS ADVANCED BY MR. MUNRO HULL FOR THE COWS "CLOVER" AND "TINKERBELL."

1. These cattle never mature more than a few odd female cattle ticks during the whole course of a year.	In the last experiment the cows "Clover" and "Tinkerbell" were placed in a ticky paddock for 27 days, and then removed to and kept in stalls for 25 days, during which time no less than 230 fully-matured ticks were obtained from "Clover" and 860 fully-matured ticks from "Tinkerbell." To be brief, as 230 and 860 fully-matured ticks were removed from "Clover" and "Tinkerbell" respectively in 23 days, it is absolutely incorrect and misleading to say that these cattle during the whole course of a year never mature more than a few odd female ticks. It might also be noted that large numbers of engorged ticks dropped off and were found on the floors of the stalls, but are not included in the totals given above.
2. They never require any attention as regards the tick.	As a result of 27 days' exposure in a ticky paddock, these two cows became so badly tick-infested, and so suffered from tick-worry that dipping or spraying would certainly have been justified.
3. They never need dipping and may be turned out on *any* country for indefinite periods without suffering *any* ill-effects from cattle ticks.	
4. They are regularly and heavily infested (or attacked) by millions of larval ticks.	The degree of infestation depends entirely upon the conditions of environment.
5. With the exception abovementioned these infesting ticks die before becoming more than just visible to ordinary eyesight—*i.e.*, when still very minute.	This is incorrect. *Vide* answer to No. 1.
6. Probably in the pupa stage of development.	
7. They remain at all times sleek and clean in appearance, without blemish of any description.	This is directly opposed to my finding, as on each occasion that "Clover" and "Tinkerbell" were exposed to ticky pastures they became covered with sores, while portions of the skin were denuded of hair.
8. That this peculiarity is transmitted in *every case* to their progeny.	"Clover's" calf, which is now over 13 months old, has been more or less heavily tick-infested since it was a few weeks old. It is unfortunate that "Tinkerbell's" calf, which was dropped at Traveston (Mr. Walker), has not been received at the Stock Experiment Station from Traveston.
9. That this peculiarity does not develop in their progeny until *after* the first year of their life.	

ANSWERS TO THE 25 CLAIMS ADVANCED BY MR. MUNRO HULL FOR THE COWS "CLOVER" AND "TINKERBELL"—*continued.*

10. That this peculiarity is transmissible by *contact*—*i.e.*, natural infection and by vaccination.	A number of cattle, young and old, and of either sex running with "Clover" and "Tinkerbell" have not acquired the so-called tick-killing property, nor have I been successful in transmitting the alleged immunity by vaccination.
11. That the source of infection and vaccination is *not* the state of dermatitis produced by excessive tick-worry.	The skin lesions referred to by Mr. Hull in various terms, and from which he obtained his alleged vaccine, are caused by ticks. By way of proof:—If the cattle are kept free from ticks no such lesions as described by Mr. Hull will develop.
12. That the few odd ticks found to mature on these cattle are not "survivors" but are such as have developed on ordinary cattle, have become displaced without mutilation, and have reattacked these special cattle.	This is incorrect, as in the last experiment the cows "Clover" and "Tinkerbell" were kept in stalls and free from contact with any other animal. Moreover, as my investigations show, it is only on rare occasions and with the greatest difficulty that mature ticks after removal can be made to reattach themselves to the same or another animal, while with partly or fully engorged females this is a physical impossibility.
13. That these odd mature ticks are *never* found on those parts of the cow where ticks abound most in ordinary cattle—*i.e.*, legs, belly, udder, ears, chine, dewlap, or escutcheon. 14. These ticks are most frequently found (in all cases under observation during the last *four* years) on the shoulder, neck, or ribs.	It was found that the ticks possessed no powers of discrimination, as they were found developing and fully-engorged on all parts of the bodies of "Clover" and "Tinkerbell."
15. That when birds are active *no ticks* can be found at all on these cattle.	Although some of the insectivorous birds will eat cattle ticks, close observation shows that ticks cannot be eradicated from any animal by birds.
16. That regular trials, extending without a break for three years, to hatch the eggs laid by the few odd mature females found on these cattle have invariably been failures. 17. That no difficulty was experienced in hatching control eggs from ordinary cattle.	My experience is quite the reverse, as eggs laid by ticks taken from "Clover" and "Tinkerbell" hatch as readily at all seasons of the year as eggs of ticks taken from other cattle.
18. That during the *winter* months these cattle will mature more female ticks than in the summer, when ticks are most active.	There is practically no difference between the nature of the infestation of the so-called proof cattle and that of ordinary cattle during either the winter or the summer months.
19. That temperature tests made in winter with a ground temperature of 53 degrees Fahr. showed that these cattle invariably ranged from 1 degree to 2½ degrees higher than the ordinary cattle tested at the same time.	This is not borne out by my investigations.

ANSWERS TO THE 25 CLAIMS ADVANCED BY MR. MUNRO HULL FOR THE COWS "CLOVER" AND "TINKERBELL"—*continued.*

20. That when these tests were made ticks were wholly absent from the ordinary stock, but were found in small numbers (from 3 to 7) on all the special cattle under test (min. 3, max. 7).	*Vide* answer to No. 18.
21. That I estimate the total possible crop of female ticks per cow for the year to be from 50 to 100 only.	According to the experiment outlined in Answer No. 1, these so-called tick-killing cows will mature some thousands of ticks per year.
22. That if all the stock on a farm or in the State were infected with this peculiarity, the cattle tick would be *exterminated* in a single season.	This statement is refuted by the fact that ticks will readily mature on the so-called proof cattle, for 135 fully-matured female ticks were recently picked off "Tinkerbell" in one day.
23. That at no time has it ever been claimed that larval ticks would not attack or infest these cattle, as stated in Official Report dated 15th May, 1913.	In a letter dated 16th March, 1912, to the Department, Mr. Hull writes that the cattle that have contracted the disease are at all times free from ticks. Moreover, he has frequently referred to these cows as being proof and immune.
24. That *fully developed male* cattle ticks are frequently found on these cattle.	The relative proportion of male to female ticks on "Clover" and "Tinkerbell" was in no way different to that on other cattle.
25. That without females to propagate with, these males (which are obviously perambulatory) are a negative quantity and wholly to be dispensed with in the present case.	

JACK SPANIARDS.

In the "Agricultural News" (Vol. XIV., p. 298) the Curator, Montserrat, in a letter to the Imperial Commissioner, states that the Jack Spaniards (*Polistes annularis*) introduced into Montserrat from St. Vincent in 1910 had for several years been plentiful at Blake's Estate, where they were first established.

Recent reports were to the effect that these insects were spreading to adjoining estates to a distance of four miles to the south-east, and to an equal distance to the north-west. This has been confirmed by a personal visit on the part of the Curator with regard to the spread to the south-east, but in the opposite direction careful search failed to confirm the report.

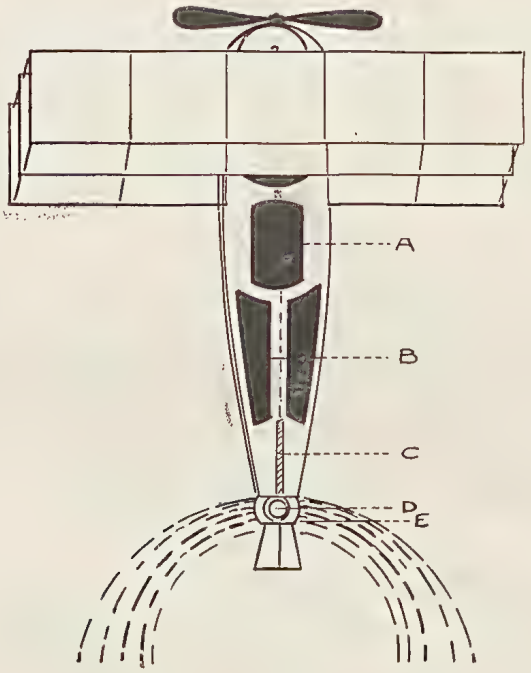
Attempts made in 1914 to redistribute the Jack Spaniard to other parts of the island from Blake's were not successful. The establishment of this insect, and its spread in Montserrat, is of considerable interest, since it has proved to be of value in keeping the cotton worm in check.

In the "Agricultural News" (Vol. XIV., p. 298), an article on West Indian Wasps appeared, in which the importation of Jack Spaniards into Montserrat is mentioned, and an account is there given of a "disease" of the native wasps (*P. crinitus*), which may be responsible for the failure of *Polistes annularis* to establish itself in certain districts in Montserrat, although this matter has not been investigated fully.—"Agricultural News," Barbados.

Science.

FORCED RAIN PRECIPITATION.

We have received the following letter from Mr. F. C. Snodgrass, Melbourne, on the subject of rain-production, a matter which has long engaged the attention of scientific men. Many residents of Queensland will remember experiments made by Professor Pepper to induce a fall of rain by means of a captive kite and by gunfire, which, however, proved unsuccessful. The method proposed by Mr. F. C. Snodgrass appears to be theoretically possible, but theory is not always feasible in practice. Briefly, the idea is based on the action of sea-salt and soda. These substances being finely crushed to a powder and aerially distributed over and above the heavy rain-laden vaporous cloud-masses which move across Australia in the summer-time and during droughts—when stock, grass, cereals, &c., are perishing for want of rain—would, Mr. Snodgrass believes, dissolve, and each particle, assuming an aqueous formation in drops and droplets and amalgamating, would unloose the cloud-rain bonds of Nature, as it sinks through it and produce a rain precipitation as usual. Should this theory be borne out, on trial tests, it is obvious that it will revolutionise the pastoral and other rural industries, replenishing watercourses, reservoirs, and dams, and refreshing the natural grasses and artificial crops on the limited areas passed over.



References to Diagram.

A—Crew accommodation.

B—Storage bunkers, on each side.

C—Revolving screw-feeding cylinder.

D—Revolving perforated drum.

E—Distributor.

Dr. F. M. Gellatly, Director of the Science and Industry Institute, states that he is much interested in the matter and will place it before the Executive.

These things will serve to convince people of the apparent practicability of the scheme pending the trial test. Should this prove successful, the values and output of all pastoral and farming properties would be increased very greatly, as would also the revenue of the Commonwealth, depleted as it is by war conditions.

In the Cloncurry district, the papers report stock to be dying by thousands through want of rain and consequent drought conditions; and these conditions prevail in other parts of the Commonwealth. In 1914, Mr. S. Kidman lost 70,000 head of cattle by drought. These facts speak for themselves.

The necessary machinery would be driven by cogs, cog-wheel, and chain gearing along a shaft from the engine to a revolving distributor as per diagram. In December, 1917, and August, 1918, Mr. Snodgrass says, he wrote two letters about this method in the "Pastoral Review," and had no adverse criticism.

Being fifty-seven years of age, and possessing only small private means, Mr. Snodgrass can go no further in the matter, and simply awaits the action of the authorities on the subject, as well as of all interested.

(This method has no connection with Ballsillie's Patent nor with any other.)

ECONOMY IN USING POTATOES.

An article appears in the "Journal of the Board of Agriculture" of England and Wales on economy in using potatoes. Trial has shown that the most common method of cooking potatoes—paring, then boiling after placing the pared tubers in cold water—is the most wasteful method practised. This is so for three reasons: first, not only the skin, but the surface layer and perhaps 10 per cent. of the flesh are removed by thick paring, partly owing to deeply sunk eyes and surface irregularity; the total loss may, indeed, amount to as much as 20 per cent. of the whole tuber—or 1 lb. in every 5 lb. The surface layers, which are wasted, contain a larger percentage of solids than the remainder; and lastly, the subsequent boiling dissolves the soluble ingredients of the potato and also breaks down the outer surface into the water—which is thrown away.

Experiments on the subject have shown that pared potatoes put into cold water and boiled lost 15.8 per cent. of their protein or flesh-forming substances, 18.8 per cent. of their ash or mineral matter, and some 3 per cent. of their carbohydrates or starch. Plunged at once after paring into boiling water and boiled, they lost 8.2 per cent. of their protein, about 18 per cent. of their ash, and a small amount of their starch. On the other hand, when boiled in their jackets, potatoes lost only 1 per cent. of their protein, a little over 3 per cent. of their ash, and practically none of their starch whether plunged in cold or hot water at the start.

It is clear, therefore, that if pared potatoes are placed direct in boiling water, the loss in boiling is very much reduced compared with the usual methods—placing in cold water; steaming instead of boiling also reduces the loss; while boiling or steaming in their jackets reduces all losses to a minimum—both the boiling losses and the primary 20 per cent. loss due to paring are almost wholly avoided.

Considering the facts already outlined, in cooking for the table, potatoes should be boiled or steamed in their jackets. Slow cooking is desirable so that the skin does not bake on to the flesh and so cause loss. The skin should be pricked or cut before baking to permit the escape of steam. If because of injuries to the surface or for any other reason, potatoes must be pared, they should be cooked by steaming, or by cooking in the smallest possible quantity of water, which should be boiling when the potatoes are put in. The water should not be thrown away but should be used as a basis for soups. The same applies to the cooking of beans. The loss in boiling is reduced if salt is added to the water.

As a general rule with all vegetables, it is more economical to steam them rather than to boil them. The information given above refers primarily to English potatoes, but the general principles hold good for sweet potatoes and yams and other West Indian vegetables. In view of the high cost of living in the West Indies and the possible shortage of food in the future, it will be well to bear the foregoing facts in mind, as it will be seen that the preparation of vegetables for the table is in many cases accompanied by a very considerable loss of nutrient material.

General Notes.

SOCIETIES, SHOW DATES, ETC.

The Rockhampton Agricultural Society's Show dates have been fixed for the 19th, 20th, and 21st June, 1919.

LONDON QUOTATIONS.

There was a slump in the market on 16th January in honey, and 1,144 cases of Australian honey offered at auction were all bought in at 150s. per cwt.

Cotton, on the same date, was quoted at 17.03d. per lb.

Rubber: Para rubber sold at 2s. 6¼d. and Plantation at 24¾d. per lb.

A REMEDY FOR PARASITICAL BRONCHITIS IN CALVES.

Mr. E. H. Hallam, M.R.C.V.S., lately visited a farm at Winora for the purpose of examining calves, and from a personal examination found that they were suffering from parasitical bronchitis, commonly known as "Hoose." He recommended the following treatment:—Turpentine, 1 tablespoonful; linseed oil, 2 tablespoonfuls, to be given three times a week.

REMEDY FOR THE STING OF THE NETTLE TREE.

"Bushman" Pomona, writes:—Many selectors and others working in the bush will often get stung by the nettle tree (Gympie) which causes hours of intense pain. I have tried many remedies, but the only one I have found to give relief is Venice turpentine. It should be smeared over the injured part and then a bandage applied. This will deaden the pain and make life tolerable.

EXPORT OF FRUIT, FARM PRODUCE, AND VEGETABLES FROM BRISBANE DURING DECEMBER, 1918.

To New South Wales, 3,463 cases of bananas, 7,346 cases of pineapples, 796 cases of passion fruit, 684 cases of cucumbers, 11,000 cases of mixed fruit, and 1,464 cases of canned pines. The December exports from Brisbane to Victoria comprised 5,720 cases of bananas, 1,365 cases of pineapples, 1,786 canned pines, and 600 cases mixed fruit. The exports oversea for the month were 2,220 cases pineapples, 151 cases jam, and 2,000 cases marmalade.

IMPORTS FROM THE SOUTH.

Imports from the South included 24,884 cases fruit, 18,180 bags potatoes, and 4,045 bags onions.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY, 1919.

Article.		JANUARY.
		Prices.
Bacon	lb.	9d. to 11d.
Barley	bush.	5s. 6d. to 6s.
Bran	ton	£6 to £7
Broom Millet	„	£50 to £75
Broom Millet (Sydney price)	„	£80
Butter (First Grade)	cwt.	172s. 5d.
Chaff, Mixed	ton	£10 to £14 10s.
Chaff, Oaten	„	£9 to £11 5s.
Chaff, Lucerne	„	£10 5s. to £17 6s. 8d.
Chaff, Wheaten	„	£7 to £10 15s.
Cheese	lb.	11d. to 11½d.
Flour	ton	£12
Hams	lb.	1s. 6d. to 2s.
Hay, Oaten	ton	...
Hay, Lucerne	„	£4 to £12 5s.
Hay, Wheaten	„	...
Honey	lb.	3d. to 5d.
Maize	bush.	7s. 2d. to 8s. 8½d.
Oats	„	3s. 10d. to 4s.
Onions	ton	£12 10s. to £13 10s.
Peanuts	lb.	6d. to 7d.
Pollard	ton	£7 to £8
Potatoes	„	£24 to £34
Potatoes (Sweet)	cwt.	6s. to 7s.
Pumpkins (Cattle)	ton	£15
Eggs	doz.	10d. to 1s. 5d.
Fowls	per pair	3s. 2d. to 7s. 9d.
Ducks, English	„	3s. 6d. to 4s. 3d.
Ducks, Muscovy	„	7s. to 9s. 2d.
Geese	„	8s. 6d. to 10s.
Turkeys (Hens)	„	12s. to 13s. 6d.
Turkeys (Gobblers)	„	18s. 5d. to 42s.
Wheat (Milling)	bush.	5s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar-bag	3s. to 5s.
Beetroot, per dozen bundles	1s. to 2s.
Cabbages, per dozen	8s. to 14s.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	1s. to 2s. 3d.
Lettuce, per dozen	...
Marrows, per dozen	4s. to 7s. 6d.
Parsnips, per dozen bunches	9d. to 2s.
Peas, per sugar-bag	3s. 6d. to 8s. 6d.
Sweet Potatoes, per sugar-bag	6s. to 7s. 6d.
Pumpkins (table), per cwt.	5s. to 13s.
Tomatoes, per quarter-case	4s. to 10s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	JANUARY. Prices.
Bananas (Queensland), per case	14s. to 20s.
Bananas (Tweed River), per case	14s. to 27s.
Bananas (Fiji), per bunch	Nominal
Bananas (G.M.), per bunch	Nominal
Bananas (G.M.), per case	Nominal
Cherries, per 12lb. box	10s. to 12s.
Cucumbers, per double case	4s. to 8s.
Lemons (local) per bushel-case	20s. to 22s.
Mandarins, per bushel-case	...
Mangoes, per bushel-case	8s. to 11s.
Oranges (Navel), per case	10s. to 15s.
Oranges (Local), per case	16s. to 18s.
Oranges (Queensland), per case	...
Papaw Apples (Queensland), per half-case	10s.
Passion Fruit (Queensland), per bushel-case	8s. to 13s.
Pineapples (Queens), per double-case	10s. to 14s.
Pineapples (Ripleys), per double-case	7s. to 8s.
Pineapples (Common), per double-case	7s. to 8s.
Tomatoes, per half-case	4s. to 7s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Eating, per bushel-case	8s. to 17s. 6d.
Apples, Cooking, per bushel-case	6s. to 8s. 9d.
Apricots, per quarter-case	5s. to 10s. 6d.
Bananas (Cavendish), per dozen	3½d. to 6½d.
Bananas (Sugar), per dozen	4d. to 5d.
Cherries, per box	8s. to 12s.
Citrons, per hundredweight	7s. to 8s.
Cocoanuts, per sack	15s. to 25s.
Figs, per dozen boxes	6s. to 10s.
Custard Apples, per quarter-case	...
Grapes, black, per lb.	2d. to 3d.
Grapes, white, per lb.	1½d. to 2½d.
Lemons (Lisbon), per case	14s. to 16s.
Mandarins, per case	6s. to 9s.
Mangoes, (market glutted) per case	1s. to 5s.
Nectarines, per case	6s. to 9s.
Oranges (Navel), per case	15s.
Oranges (Seville), per hundredweight	12s.
Oranges (Other), per case	3s. to 5s. 6d.
Papaw Apples, per quarter-case	1s. 6d. to 3s. 6d.
Peaches, per quarter-case	4s. to 9s. 6d.
Peanuts, per lb.	6d. to 7d.
Persimmons, per quarter-case	3s. 6d. to 4s.
Pineapples (Ripley), per dozen	3s. to 6s. 5d.
Pineapples (Rough), per case	6s. to 9s.
Pineapples (Smooth), per dozen	1s. 6d. to 2s. 6d.
Plums, per case	4s. to 8s. 6d.
Rockmelons, per dozen	1s. 6d. to 8s.
Sugar-melons, per dozen	4s. to 12s.
Strawberries, per dozen boxes	...

TOP PRICES, ENOGGERA YARDS, DECEMBER, 1918.

Animal.	DECEMBER. Prices.
Bullocks	£22 5s. to £30 15s.
Cows	£16 7s. 6d. to £20 10s.
Merino Wethers	46s. 3d.
Crossbred Wethers	48s. 6d.
Merino Ewes	43s. 6d.
Crossbred Ewes	32s. 6d.
Lambs	31s.
Pigs (Bacon)	70s.
Pigs (Porkers)	56s.
Pigs (Slips)	22s. 3d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, 1918, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1918 AND 1917, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Dec.	Average Rainfall. No. of Years' Records.	Total Rainfall. Dec., 1918.	Total Rainfall. Dec., 1917.
North Coast.	In.		In.	In.
Atherton	7·88	17	4·12	9·88
Cairns	9·55	36	4·94	13·14
Cardwell	8·69	46	3·90	12·27
Cooktown	7·26	42	4·71	21·68
Herberton	5·71	31	3·81	7·39
Ingham	7·46	26	5·21	18·26
Innisfail	12·76	37	4·73	25·33
Mossman	13·79	10	10·97	15·37
Townsville	5·82	47	0·80	11·03
Central Coast.				
Ayr	3·87	31	2·31	8·22
Bowen	4·53	47	0·85	16·05
Charters Towers	3·69	36	0·35	3·09
Mackay	7·13	47	0·25	13·19
Proserpine	9·68	15	1·57	19·30
St. Lawrence	4·46	47	0·43	8·37
South Coast.				
Biggenden	4·51	...	0·74	3·28
Bundaberg	4·47	35	1·38	3·02
Brisbane	4·96	67	0·88	5·19
Childers	5·17	23	0·70	2·64
Crohamhurst	7·32	25	3·02	7·38
Esk	4·36	31	1·54	6·17
Gayndah	3·83	47	1·25	2·91
Gympie	5·90	48	0·69	6·91
Glasshouse M'tains	7·65	10	1·92	9·14
Kilkivan	4·28	39	1·38	4·39
Maryborough	4·52	47	2·21	5·21

Divisions and Stations.	Average Rainfall. Dec.	Average Rainfall. No. of Years' Records.	Total Rainfall. Dec., 1918.	Total Rainfall. Dec., 1917.
South Coast—continued:	In.		In.	In.
Nambour	6·46	22	3·14	7·74
Nanango	3·66	36	1·83	4·54
Rockhampton	4·45	31	2·91	3·09
Woodford	5·45	31	1·86	5·56
Darling Downs.				
Dalby	3·13	48	3·84	4·07
Emu Vale	3·52	...	3·52	5·05
Jimbour	3·15	...	2·32	3·26
Miles	2·53	33	0·56	1·96
Stanthorpe	3·49	45	3·27	5·99
Toowoomba	4·22	46	2·33	6·10
Warwick	3·47	31	2·57	4·95
Maranoa.				
Roma	2·34	44	0·27	2·34
State Farms, &c.				
Bungeworgorai	3·12	4	0·43	3·10
Gatton College	3·48	...	1·57	7·14
Gindie	...	...	Nil	2·13
Hermitage	2·80	...	3·31	4·38
Kairi	10·29	4	5·61	10·55
Sugar Experiment Station, Mackay	9·02	...	0·33	13·04
Warren	4·18	4	2·10	3·28

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December, 1918, and for the same period of 1917, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·41	6·20	5·58	5·47
2	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
3	4·59	6·46	5·23	6·41	5·42	6·18	5·59	5·44
4	5·0	6·46	5·24	6·41	5·43	6·17	6·0	5·43
5	5·0	6·46	5·24	6·40	5·44	6·16	6·0	5·42
6	5·1	6·47	5·25	6·39	5·44	6·15	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·12	6·2	5·38
10	5·3	6·47	5·28	6·36	5·46	6·11	6·3	5·37
11	5·4	6·47	5·29	6·36	5·47	6·10	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·9	6·4	5·35
13	5·6	6·47	5·31	6·35	5·48	6·8	6·4	5·35
14	5·6	6·47	5·31	6·34	5·49	6·7	6·4	5·34
15	5·7	6·47	5·32	6·33	5·49	6·6	6·5	5·33
16	5·8	6·47	5·33	6·32	5·50	6·5	6·5	5·32
17	5·9	6·47	5·33	6·31	5·50	6·4	6·6	5·31
18	5·10	6·47	5·34	6·30	5·51	6·3	6·6	5·30
19	5·10	6·47	5·35	6·29	5·51	6·2	6·7	5·29
20	5·11	6·47	5·35	6·28	5·52	6·1	6·7	5·28
21	5·12	6·46	5·36	6·28	5·52	6·0	6·8	5·27
22	5·13	6·46	5·36	6·27	5·53	5·59	6·8	5·26
23	5·14	6·46	5·37	6·26	5·53	5·58	6·9	5·25
24	5·15	6·45	5·38	6·25	5·54	5·57	6·9	5·24
25	5·16	6·45	5·38	6·24	5·54	5·56	6·10	5·23
26	5·16	6·45	5·39	6·23	5·55	5·55	6·10	5·22
27	5·17	6·44	5·40	6·22	5·56	5·53	6·11	5·21
28	5·18	6·44	5·41	6·21	5·56	5·52	6·11	5·20
29	5·19	6·43	...	...	5·57	5·50	6·12	5·19
30	5·20	6·43	...	...	5·57	5·49	6·12	5·18
31	5·21	6·42	...	...	5·58	5·48	..	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.
2 Jan.	●	New Moon	6	24 p.m.
9 „	☾	First Quarter	8	55 p.m.
16 „	○	Full Moon	6	45 p.m.
24 „	☽	Last Quarter	2	22 p.m.

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

1 Feb.	●	New Moon	9	7 a.m.
8 „	☾	First Quarter	4	52 a.m.
15 „	○	Full Moon	9	38 a.m.
23 „	☽	Last Quarter	11	48 a.m.

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

2 Mar.	●	New Moon	9	12 p.m.
9 „	☾	First Quarter	1	14 p.m.
17 „	○	Full Moon	1	41 a.m.
25 „	☽	Last Quarter	6	34 a.m.

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Orchard Notes for March.

THE SOUTHERN COAST DISTRICTS.

The marketing of the main crop of pineapples will continue to occupy the attention of growers; and as it is probable that the plantations have been allowed to get somewhat dirty during the previous month, they should be cleaned up as soon as ever the crop has been got off. The fruit of the new crop of citrus fruit will be showing signs of ripening towards the end of the month; and as the fruit during this period of its growth is very liable to the attack of insect pests of various kinds, it is important that steps should be taken to prevent loss arising from this cause as far as possible.

Large sucking moths of several kinds attack the fruit as soon as it shows signs of ripening; and as they always select the first fruit that shows signs of colouring, it is a good plan to gather a few forward fruit and to ripen them up quickly by placing them on a barn floor, and covering them up with bags or straw. They will turn colour in a few days, and develop the characteristic scent of the ripening fruit. The fruit so treated should be hung up in conspicuous places in the orchard as trap-fruit, as not only will it attract the moths, but also the fruit-flies. The moths will be found clustered round the trap-fruits in large numbers, and can then be easily caught and destroyed. Fruit-fly will also puncture such fruit; and if the fruit is destroyed before the larvæ reach maturity, a later crop of these insects is prevented from hatching out. Fruit-flies may also be caught in large numbers by means of such artificially ripened fruits. The fruits are smeared with tanglefoot, and hung about the orchard. The fly, attracted by the colour, settles on the fruit, and is caught in a similar manner to house-flies on specially prepared sticky paper. These simple remedies, if carefully carried out, will result in the destruction of large numbers of sucking moths and fruit-flies.

The yellow peach-moth that does such damage to peaches in spring, and that attacks corn, sorghum, cotton bolls, custard apples, and many other plants and fruits, often does a lot of damage to citrus fruits. It acts in a very similar manner to the second and later generations of the Codling moth of pomaceous fruits, in that it lays its eggs where two fruits touch, under the shelter of a leaf on the fruit, at the stem end of the fruit, and, in the case of navel oranges, in the navel itself; in fact, anywhere that there is a likelihood of the egg not being disturbed. The egg hatches out into a small spotted caterpillar, which eats its way into the fruit, causing it to ripen prematurely, and fall off. Where two fruits touch, it often eats into and destroys both, and it frequently leaves one fruit to go and destroy a second. It is a very difficult insect to deal with, owing to the number of fruits and plants on which it lives; but, as far as citrus fruits are concerned, the best remedy is undoubtedly to spray the fruit with a remedy that will destroy the young insect when it starts to eat the skin of the fruit. Bordeaux mixture has been found efficacious, but I am of opinion that spraying with Paris green and lime, Kedzie's mixture, or arsenite of lead, will also have good results. The latter poison is, in my opinion, well worth giving a thorough test, as it sticks to the fruit and leaves for a long time. Bordeaux mixture, either alone or in conjunction with Paris green or Kedzie's mixture, is, however, a good remedy, as not only will it destroy the larvæ or prevent the moth from attacking the tree, but it is also the best remedy for black brand or melanose, as well as tending to keep all other fungus pests in check. Fight fruit-fly systematically—both by means of the sticky fruit already recommended and by gathering all fly-infested fruit, such as guavas, late mangoes, kumquats, &c., as well as any oranges or mandarins that may have been infested, as if kept in check now there will be little loss throughout the season. A little fruit will be marketed towards the end of the month. See that it is gathered and sweated for seven days before marketing, and

don't gather it too immature. Beauty of Glen Retreat mandarins are often gathered and marketed as soon as they show signs of colouring. They are then as sour as a lemon, and anyone who is unlucky enough to buy them will steer off mandarins for some time to come. This variety should not be gathered till thoroughly ripe, as when marketed in an immature state it spoils the market, as it puts people off eating citrus fruit.

Clean up the orchard after the summer rains, and have everything ready for the marketing of the crop. See that there is a good supply of clean, dry case timber on hand, as one of the greatest sources of loss in shipment is packing fruit in green cases.

Strawberry planting can be done throughout the month. Plant such berries as Federation on the lowest ground, and Aurie, Anetta, Trollop's Victoria, and Glenfield Beauty on warm, well-drained soils. Prepare the land thoroughly, so that it is in perfect tilth, and in a fit state to retain moisture well; as on this, as much as anything, the success of the crop depends. Where new orchards are to be planted, get the land ready—not the clearing, which should have been done months ago, but the working of the land, as it is advisable to get it thoroughly sweetened before putting the trees in.

THE TROPICAL COAST DISTRICTS.

The Notes for February apply equally to March. See that bananas are netted—keep down weed growth, and market any sound citrus fruits. Clean up the orchards as well as possible, and keep pines clean. Get land ready where new orchards are to be set out, as tree-planting can be done during April and May. Pines and bananas can still be planted, as they will become well established before winter.

THE SOUTHERN AND CENTRAL TABLELANDS.

Finish the gathering of the later varieties of deciduous fruits, as well as grapes. Clean up the orchard, and get ready for winter. Get new land ready for planting; and where there are old, dead, or useless trees to be removed, dig them out and leave the ground to sweeten, so that when a new tree is planted to replace them the ground will be in good order.

In the drier parts, where citrus trees are grown, keep the land well worked, and water where necessary.

Farm and Garden Notes for March.

FIELD.—Take every opportunity of turning up the ground in readiness for sowing and planting winter crops. The main crop of potatoes should at once be planted. As the growth of weeds will now be slackening off, lucerne may be sown on deeply cultivated soil. The latter should be rich and friable, with a porous subsoil. The land should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. Prepare the land a couple of months before sowing, care being taken to cross plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed will be required; in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do any damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is now too late to sow maize, even 90-Day, with any certainty of

harvesting a crop of grain. Rye grass, prairie grass, Rhodes grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and Swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola-nut cuttings. Some temperate-zone vegetables may be planted, such as egg plant, potatoes, &c. Coffee-planting may be continued. Harvest kafir corn and paddy. Cotton picking will now be in full swing. Pick cleanly, and expose to the sun for a few hours before storing or baling. Pick none but fully ripe bolls.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, Jacobean lilies, tigridia, tritonia.

All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Herbaceous plants and annuals which it is intended to raise from seed should be sown this month. Such are antirrhinums (snapdragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmea, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done.

Now, as to climbers which may now be planted. These are—*Allamanda Schotii* (beautiful yellow), *Antigonon leptopus*, a charming cerise-coloured climber; *Aristolochia elegans*, handsome as an orchid and easily grown; *Aristolochia ornithocephala* (Dutchman's Pipe), very curious, large, always attracts attention; *Asparagus plumosa* grows in any shady place; *Beaumontia grandiflora*, splendid white flower, grand for a fence, will grow 50 ft. high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; *Quisqualis indica*, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the *Bauhinia scandens*, rarely seen about Brisbane. We grew a plant of this climber at Nundah, and it soon closed in the front of the veranda for a distance of over 80 ft. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossoms, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th of March. All unoccupied land should be roughly dug, and, when required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French and broad beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, onions, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day and gathered, whether required or not, for if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form inferior, ill-shaped, and hence unsaleable fruit.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

COST OF COTTON-PICKING.

Why is it that would-be cotton-growers are often deterred from entering on this world-important industry owing to an impression that any profit which might accrue from its cultivation would be minimised by the cost of picking the crop by white labour. We have frequently pointed out the fallacy of this idea. On the subjects of growing and picking cotton, Mr. D. Jones, Instructor in Cotton Culture, Queensland Department of Agriculture, in a letter to a Brisbane newspaper last month, challenged the too-often repeated statement that the cotton industry needs cheap labour for its development. "Rather than this," he said, "the converse is true, particularly in countries where the white labour competes with black, as is the case in the American cotton belt. The Imperial Dominions Commission, when here, raised this issue. A direct challenge to prove it moved them to get a Consular report on the question, bearing out my statement that the white man could raise cotton better and cheaper than can the coloured folk.

"Beyond this is the fact that labour for many years past has been on the whole in America better paid than on Australian farms, even allowing in instances the high rural log awards of our Southern States. Mexican greasers in the new cotton belt of the Imperial Valley in California are said to be paid 1s. an hour for their work. It is a usual thing for farm labour in the States to be paid from 4 to 5 dollars a day. The American negro is a hustler at picking cotton and can and does earn from 10s. to 12s. a day in the field. How many get this remuneration in Queensland, be they employers or employees? It is quite possible for any active juvenile to gather 100 lb. of fibre per day, which costs rather under 5s. than over to raise. This cotton at 3d. per lb. (1d. less than paid last season) is worth 25s., hence a worker, if on his own crop, is richer by 20s. for his day's toil. Assuming he had to pay ¾d. per lb. for someone else to gather it, he then would be in pocket, and the juvenile worker the better off by 6s. 4d.; if his ability to gather 200 lb. a day were demonstrated, an easy task for an expert picker, his earnings would be 12s. 8d. per day."

[The "Monthly Crop Report," Washington, U.S.A., quotes the following prices per 100 lb. for picking cotton by white labour at the opening of the last season in the cotton-growing States:—

"North Carolina, 4s. 11d.; South Carolina, 4s. 1½d.; Georgia, 4s. 2d.; Florida, 5s. 7d.; Alabama, 3s. 10d.; Mississippi, 4s.; Louisiana, 4s. 2d.; Texas, 5s. 2d.; Arkansas, 5s. 4d.; Tennessee, 5s. 5d.; Oklahoma, 6s.; California, 8s. 4d. Roughly, the cost in the above States per lb. would amount to about 3¾ farthings (less than 1d.). The cost of picking in Queensland's palmy days of cotton-growing was ½d. per lb. (white labour), at which price young people were able to earn from 3s. 4d. to 5s. per day, whilst expert two-hand pickers made 8s. 4d. per day, starting at 9 a.m., the late start being necessary to allow the cotton to be dry after the night dew."]

SUBSOIL BLASTING.

Since the war explosives have been expensive and they have been hard to secure. In consequence, there has been a falling away in the interest which was being taken in the subject of farming with explosives. In the early days many claims were made for explosives which had to be taken for granted. The effect of subsoiling could only be surmised. There seemed little doubt that to stir up the subsoil must make a great difference in the yield of deep-rooting crops. But there were few proofs taken over an extended period. We were interested, therefore, in some figures in the *Scientific American* bearing on some extended experiments.

Back among the hills of Georgia an interesting experiment in subsoil blasting has been in progress for the past four years. The soil in this district is of a rich upland grade, and the subsoil is red and hard, with emphasis on the hard. In 1914 2 acres were measured off. One was left for a check acre, the other was subsoiled with dynamite. Charges were exploded with blasting cap and fuse every 15 feet, 30 inches deep. This thoroughly shattered the hard, red clay, making cobweb fissures in all directions and thus permitting more water to enter than had before been possible. The roots also benefited by the breaking up of the subsoil, new avenues being opened up for them to go out in search of plant food.

Both acres were planted to cotton in 1914. Both received the same cultivation and care, though the sub-soiled one got a little more fertiliser than the other. The difference in this respect was not nearly enough, however, to account for the discrepancy between the yield of 1,804 lb. of seed cotton for the blasted acre and 912 lb. for the unblasted plot.

Corn followed in 1915. This year both plots received identical treatment and fertilisation. They were both kept well worked and clean. The yield of corn in the husk was 2,614 lb. for the blasted acre, and 1,894 lb. for the other. Owing to the wet weather, it was impossible to weigh the fodder; there were, however, 225 bundles on the blasted acre against 115 bundles on the check area.

In 1916 the plots were in cotton again, and the benefits of the blasting were more pronounced than ever. From the very start of the growing season, the cotton on the subsoil acre outgrew the other, and by midsummer it was at least twice as high. It also fruited much better than that on the unblasted land, and when the yield was measured it was found to have been exactly twice as productive—2,000 lb. against 1,000 lb.

In 1917 corn was once more planted on the two test acres. The blasted acre yielded 42½ bushels of corn and three full loads of fodder; the unblasted acre, 35 bushels and scant two and a-half loads of fodder. The conclusion was therefore forced that the blasting had been a profitable investment. The increased yields soon took up the initial cost, leaving all subsequent crop increases as net profit. This is good farming as well as good business.—"Farm Bulletin."

WHEAT-GROWING NOTES.

By R. E. SOUTTER, Manager, State Farm, Bungeworgorai.

During recent years the wheat farmer has met with a good deal of disappointment and loss, so much so that many have decided to discontinue with this crop and take up others, or go in for stock.

It is not by any means intended in the following to offer suggestions for the better cultivation of the heavy lands of the Darling Downs, where most of the wheat of the State is raised, but to make a plain statement of facts which contributed to the success of a crop of Warren wheat at the Roma State Farm, in a season when, with few exceptions, the whole of the winter crops in the State may be said to have failed, owing to the exceptionally dry season.

To prevent losses to such a degree under these conditions in the future much more attention must be paid to the principles of "moisture conservation" in the soil than is now given by the farming community. Any rainfall chart of Queensland demonstrates how necessary this is, showing as it does that the greatest precipitation occurs during the summer months, when the evaporation is greatest. It follows, therefore, that all cultural operations, more especially in the drier parts of the State, must be carried out with the object of trapping and conserving the moisture, as experienced, for the prospective crops, and until such is carried out systematically and consistently, failures will be more often recorded than successes. Experiments to determine the most suitable methods to adopt, in order to conserve the maximum amount of any given rainfall, emphasise the fact that no hard-and-fast rule can be laid down, as the condition of the soil, and kind, amount of precipitation, and the

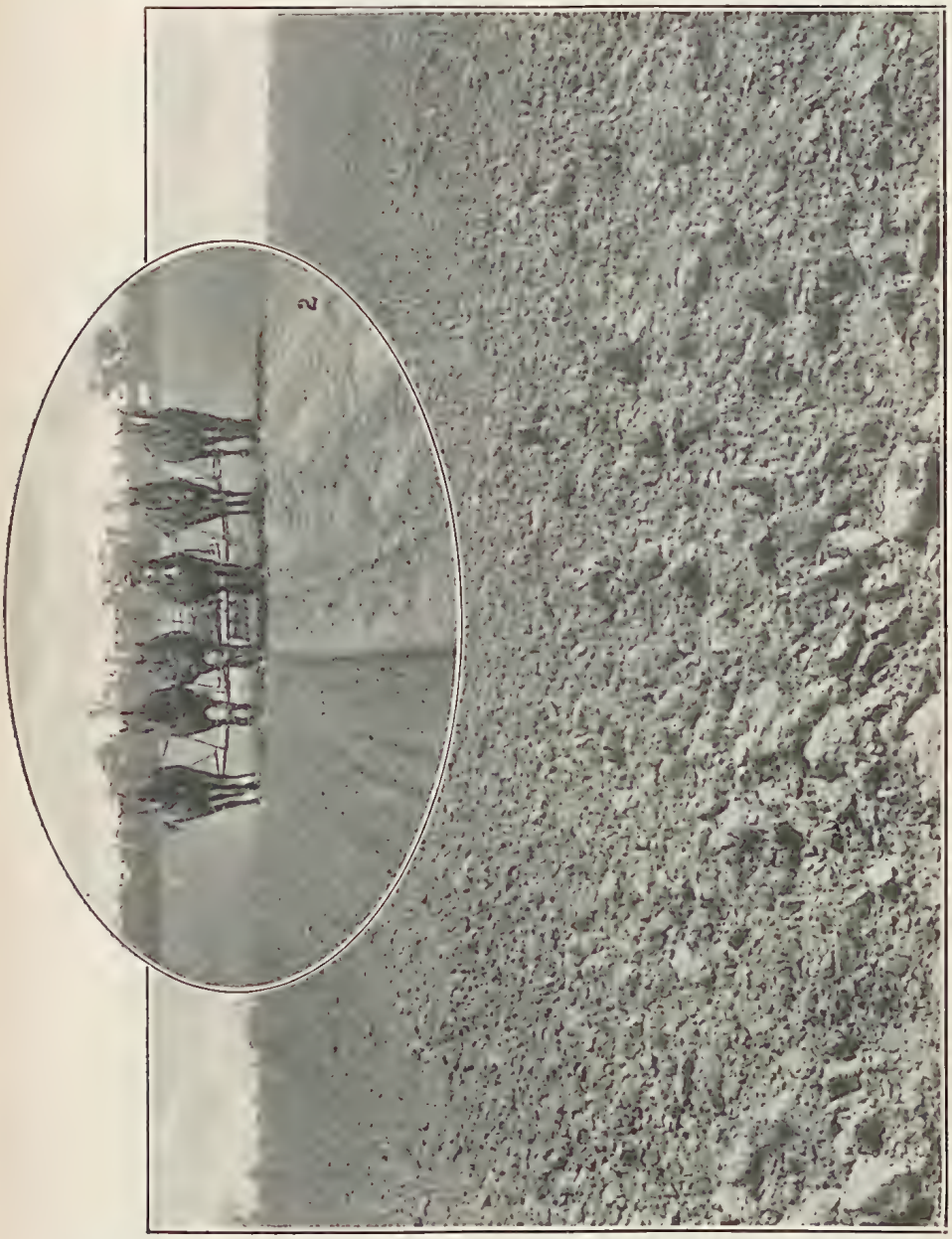


Plate 5.—Roma State Farm—Working the Fallows with the "One Way" Disc Cultivator.

manner experienced, and the time of the year necessitate different treatment, which can only be decided by the individual who is aware of the peculiarities he has to contend with; and armed with the knowledge of how to overcome them, such person must be governed by actualities and not probabilities.

The crop of Warren wheat, from which a return of approximately 24 bushels to the acre was obtained, was grown in a field of 27 acres of alluvial soil (box flat), cropped in 1916 with wheat for hay, which was cut in October. No cultural operations of any kind were carried out until November, 1917, when the field was ploughed. By that time it was in a weedy condition, and in order to make a good job of the ploughing, the vegetation was rolled down ahead of the plough, which was turning it over to a depth of between 6 and 7 inches. In January, the paddock was again ploughed; during February, owing to the presence of weeds, it was deemed advisable to cultivate it with the one-way cultivator; another skim-ploughing was given it in March; and in April the paddock was cultivated and harrowed. These operations

were necessary in order to destroy the weeds and prevent the formation of a crust on the surface, both of which quickly reduce the moisture content of the soil by transpiration, evaporation, and retarded percolation.

Seed, which was treated with copper carbonate as a smut preventive, was sown during the first week in May and germinated about the third week. The crop was harvested in the third week of October, and, as already stated, yielded approximately 24 bushels to the acre.

It is acknowledged that the working is much in excess of that usually given to the wheatfields, but all operations were absolutely necessary in order to receive the maximum benefit from each, and not only was a fairly good yield obtained, but a paying one as well, as the undermentioned figures illustrate. These latter are based on the following rates:—Man, 10s. per day; horses, 2s. 6d.; the rate for horses must be reckoned to be fairly high, as very few farmers feed their horses to anything approaching this figure:—

At per acre.	£	s.	d.
Three ploughings at 7s. 6d.	1	2	6
Two harrowings at 1s.	0	2	0
Two cultivations at 3s.	0	6	0
Drilling at 2s.	0	2	0
Seed, ½ bushel per acre at 6s.	0	3	0
¾ cwt. superphosphate at 7s.	0	5	3
Pickling, per bushel, 3d.	0	0	3
Harvesting (stripper) 4s.	0	4	0
Bags at 12s. per dozen	0	8	0
Growing and harvesting	2	13	0
Value of crop at 6s. per bushel	7	4	0
Balance (net return per acre)	£4	11	0

By removing crop with a harvester, the cost of production would be reduced by about 1s. per acre.

FODDER CROPS FOR IMMEDIATE PLANTING.

Mr. H. C. Quodling, Director of Agriculture (writing last month), in view of the many inquiries reaching the Department concerning fodder crops for immediate planting in coastal districts, advises:—

"The future of the maize crop, on which poultry, pigs, and other farm stock depend, calls for a quick-growing grain crop of high feeding value. It is, of course, not too late yet to take the risk of planting rapid-maturing kinds of maize, like Improved Ninety Day.

"Another crop which deserves attention in sheltered situations or where frosts do not generally appear early, is green sorghum. From a nutritive standpoint for stock-feeding purposes, the grain stands about midway between wheat and maize, and yields of fully 60 bushels to the acre are quite common; in fact, the departmental experimental tests made in several districts have been much higher on the average, 103 bushels per acre being secured in one instance under exceptionally favourable circumstances. Several kinds of grain sorghums are grown in Queensland, which originate from seed imported by the Department some years ago through the Bureau of Plant Industry in Washington, U.S.A. For late planting, the dwarf varieties are to be preferred, as they mature in from 3 to 3½ months, but should be grown in drills spaced wide enough apart to admit of inter-row cultivation, in preference to broadcasting.

"Dealing with the subject of fodder crops, Mr. Quodling states if the rainy season makes good there is still time before the winter sets in to raise a variety of summer fodder and ensilage crops, such as Liberty millet (giant panicum), Japanese, Manchurian, and French millet, and Soudan grass, all of which will mature in about eight weeks' time. These crops also make a rough class of hay calculated to provide bulky food for the winter.

"Of the stronger-growing and heavier-yielding fodder crops, maize and different kinds of sorghums may be sown. Planter's Friend, if sown broadcast in February, makes an excellent crop for cutting in the early part of the winter, and the advantage of selecting this variety is that it will not become too pithy to use even after a few light frosts.

"For winter crops, for soiling or grazing off, it is possible under ordinary seasonal conditions to commence by making sowings in late February of Sea of Azov, Cape or skinless barleys, with successive sowings monthly, up to the first week in July. Wheat, oats, rye, and canary seed will afford a variety of green feed, but the sowing season should be a little later, the first sowing being made in late March or early April, for everything but the oats, which can be held over until May and June.

"Owing to susceptibility to rust, certain kinds of wheat and oats are to be preferred. Macaroni wheats, like Le Huguenot and Bald Medeah, are good coastal varieties for green feed. Of the bread varieties, Florence, Thew, and other quick-growing kinds, are likely to give the most satisfaction. Ruakura rust-resisting, Algerian and Sunrise oats are in favour for both green feed and hay.

"It is not as generally recognised as it should be that field peas and vetches make excellent additions to all winter growing cereals; grown together and mixed in this way the palatability and nutritive qualities of the fodder are increased and heavier milk flows will be accordingly maintaned by dairy cows. Dwarf Essex rape, mangolds, Swede, and other field turnips, sugar beet, and thousand-headed Kale are crops which deserve consideration where mixed farming is being carried on. The first sowing of Swedes and rape for a catch crop can be made in February, and the main sowing of the several crops named in March and April.

"Suitable farm-grown foods for pigs are likely to be very scarce this year, and the latter classes of crops will work in soon after Amber cane and grain sorghums (two useful crops for pig feeding) reach their seasonal development in the autumn."

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS—No. 3.

By P. MAHONEY.

Different Systems of Irrigating.

There are several different ways of irrigating or watering land, the most universal and successful being the furrow system. The flooding of land has in some cases been resorted to, such as in lucerne growing or in the case of any fodders which are not grown in rows. The spray system is not too highly favoured, except under certain circumstances, such as the watering of fodders which are broadcasted. The flooding system has many advantages over the former, and is less expensive. The spray system has also one great disadvantage in watering fruit trees or vines, &c., which is hereafter explained.

The Furrow System.

The means of irrigating with the aid of furrows have proved to be the most effective, least expensive, and most satisfactory, for it is possible to irrigate speedily on account of the large body of water that can be handled. Of course, that is where thorough cultivation is practised, for the better the ground is cultivated the quicker it takes in the water. Where irrigation is indulged in to any great extent in growing fruit trees or vines, &c., the furrows can be made for equal watering a little further away from the plant, thus encouraging the roots to spread, much to the benefit of the plant. But as the plant grows older, the demand for moisture is greater; therefore, to supply sufficient water with the minimum of expense and labour, it will be necessary to irrigate with two, or perhaps three, furrows on each side of the plant—that is, where the plants are 10 ft. or more apart. To give the ground a good soaking when the plants are 25 ft. or more apart, it would be necessary to make as many furrows as the nature of the ground warrants. If there is a clayey or heavy subsoil, the furrows can afford to be further apart than when it is of a sandy nature, for when the water strikes the heavy subsoil, this being harder to penetrate than the lighter soils, it has a tendency to spread along on top of it as well as soak into it; then the capillary attraction brings it to the surface. Thus, under these circumstances, it is easier to give the ground a thorough soaking. If such land happens to have only a slight fall, furrows from 2 ft. to 2½ ft. apart would suffice for a thorough watering. The greater the fall the land has, the closer the furrows should be. Once a heavy subsoil, such as described, gets a good soaking, it will retain its moisture for a wonderful length of time, providing the surface soil is well cultivated.

When the subsoil is of a heavy or clayey nature, great care should be exercised in watering, for it is under these conditions that seepage and bad drainage often occur.

In the event of the subsoil being of a sandy nature, it will then be necessary to have the furrows closer than when of a heavy nature, for then the water takes longer to soak sideways, as it has nothing to check its downward course. The closeness of the furrows also depends largely upon the fall in the land.

In watering land between the rows of plants with the aid of five or six furrows, it is not advisable to run the water down each furrow until it has had sufficient, for to do so would in all probability cause a surplus at the bottom of the furrow or on the headland, which would be of no benefit.

To avoid any waste of water, and to irrigate effectually and quickly, it is necessary to keep turning the water from furrow to furrow, allowing it to run only for a short time after it has reached the bottom before turning it into another furrow, thus avoiding any surplus water at the end of the rows. It is generally advisable to run the water in the same furrow twice, or even three times, until the ground has had enough. In all probability three and even up to six streams can be running down the furrows at once.

In furrowing out land similar to that just described, it would be necessary to have a two-horse cultivator, for with this implement it is possible to make as many as four furrows at once by attaching bursters to it.

In the event of it being difficult to avoid the accumulation of surplus water at the bottom of the rows, effective means should be resorted to for carrying it away. It should be caught in a drain and conveyed to a dam, or turned on to pasture land.

In the case of irrigating sugar-cane, which is grown in rows three or more feet apart, I presume that it would be difficult to irrigate the plants after they had attained the height of 4 or 5 ft. and over, for naturally it would have leaves spreading well across the space between the rows, and their knife-like edge would make the furrowing out and cultivating difficult or even prevent it. This, I daresay, could be overcome by giving the land a thorough watering at the last favourable opportunity, following with a thorough vigorous cultivation, which would, I daresay, bring it into maturity.

Its irrigation could in all probability be made more practicable by planting the rows further apart than usual, thus allowing for all necessary preparations and cultivation, thus making it necessary to have two furrows for watering between the rows.

Maize, vegetables, and such like, which are planted closer, would only need two furrows when the plants are young, or where the land has a fall to any extent.

The flooding of land should only be resorted to when there are no other means of watering same, such as the watering of broadcast crops. But when this is carried on, the land should be sectioned off by check banks, and each section flooded separately, thus avoiding any surplus water. The watering of land in this manner should be done on a dull day or in the evening. Great care should be taken, for the quality of crops so irrigated can be spoilt and made valueless through over watering.

The spray system of irrigation can also be used for the growing of fodders, but it is a slow process compared with flooding, and the installation and upkeep are much greater. It is inadvisable to use this system for the irrigation of fruit trees, vines, &c., for when the spray is allowed to reach the foliage and wet it, if hot and muggy weather is prevailing, it will have a tendency to breed fungus diseases, as the warm, moist, sheltered position, such as the foliage would afford, would be an ideal place for the breeding of same. It certainly is not to be compared with the furrow system in regard to the watering of large acreages.

(To be Continued.)

COTTON-GROWING IN PAPUA.

The "Papuan Courier" of 13th December, 1918, writes as follows on the subject of cotton-growing in the Possession. We have ourselves seen excellent cotton growing in some districts outside Port Moresby, on rubber plantations, and the yield and quality of the fibre left nothing to be desired. It would naturally be supposed that in that land of cheap labour, cotton-growing would prove as great a success as in Queensland in times past, but it would appear that of late years labour troubles have arisen to the detriment of the industry.

The article in the Papuan journal alluded to reads:—

"An industry that might well occupy the attention of Papuan planters is the growing of cotton. Such a vast amount of cotton was absorbed on the fields of Europe that there will be a shortage of supplies for some time to come. During the

period of the war a 12-inch gun disposed of half a bale of cotton with every shot fired. A machine gun in operation used up a bale (roughly 4 cwt.) in three minutes. In a naval battle, like the one off Jutland, from five to six thousand pounds a minute were consumed by each active warship. It took more than 20,000 bales a year to provide absorbent cotton to staunch and bind the wounds of the injured. One change of apparel for all the troops engaged in the war represented more than a million bales. One hundred thousand bales were required to equip the aeroplane fleet if cotton, as was found necessary, supplied linen for wings. The U.S.A. turned nearly a million bales a year into explosives alone. On top of this great consumption of cotton for war purposes, the United States cotton lands were infested by an insect pest, known as the boll weevil, which materially interfered with the quantity of the output.

"Middling American cotton, which in 1915 was quoted in the Liverpool market at 5.08d. per lb., was selling this year at 22.27d. per lb.

"The B.N.G.D. Co. some years ago attempted cotton-growing, and produced a first-class article. They installed a ginnery, but owing to native labour troubles they were compelled to cease operations. The quality produced was considered by English experts to be equal to the best, and it was with great reluctance the company dropped the industry.

"The Department of Agriculture in Queensland, recognising the vast possibilities attaching to the growing of cotton, offers to receive from growers raw cotton, and to gin and market it on the owners' account. An advance of 2d. per lb. for the year 1919 will be made upon the raw cotton received, and any surplus after sale, after deducting charges, will be paid to the grower pro rata. The Department will also supply growers with cotton seed free of cost, and railage paid, allowing 10 lb. of seed per acre, to provide for replants or any other contingencies.

"If Queensland can make a paying proposition of the industry, surely it is up to Papua to do likewise. With the large amount of native labour at its disposal there seems to be no reason why cotton-growing should not be established here on a large scale. At present one of the great drawbacks is the enactment that native women and children may not take part in plantation work. Women and children are eminently fitted for the picking of cotton, as their hands are more supple, and if the males were accompanied by their wives and children, the whole family bringing grist to the domestic mill, it would not only enable them to greatly improve their position financially, but would make their native happier and more contented.

"The work of cotton picking is done by women and children in the chief cotton-growing countries, which are United States of America, India, Egypt, Brazil, Peru, and Central Asia, with satisfaction both to themselves and the planter. About 40,000 lb. of seed cotton were delivered, ginned, and marketed on farmers' account during 1918 in Queensland. As the experimental efforts of the B.N.G.D. Company point to the suitability of Papua for making cotton a staple crop, we hope to see governmental support and assistance given in this direction."

[The figures quoted concerning the Queensland crop of 1918 are not quite correct. The quantity of raw cotton grown by farmers and delivered to the Departmental ginnery totalled 166,458 lb. which yielded 54,280 lb. of lint, besides 2,643 lb. of linters—that is, the short fibre which is detached from the seeds after the first ginning, which was marketed at 1s. 1d. per lb. The farmers received an advance of 2d. per lb., and when all expenses were paid, they got a further 2d. per lb., which paid them well, notwithstanding the cost of picking.—Ed. "*Q.A.J.*"]

THE SUGAR INDUSTRY.

In this month's journal we publish the first of a series of articles on the cultivation of sugar-cane in Queensland, by Mr. H. T. Easterby, General Superintendent of Sugar Experiment Stations. These will, later on, be published in Bulletin form, and should prove of great assistance to returned soldiers and others who have either already selected sugar lands in various sugar districts in this State, or who propose to enter upon the business of cane production in the near future. In the early days of this industry, suitable lands were easily obtained on navigable rivers, scrub lands, on the coast, and open plain lands, lightly timbered, were chosen in preference to the less rich hill country or to the western plains unsuitable climatically for tropical agriculture. The taking up of land, the cost of cultivation, and subsequent operations incidental to the industry will all be dealt with in the course of this series of papers, based on long experience and careful experiment in field and laboratory.

Pastoral.

OSTEO-MALACIA.

By A. MACKENZIE, Government Veterinary Surgeon.

This disease, which affects adult cattle, occurs in several parts of the State. It is due to feeding over lengthy periods on foods which contain insufficient lime to satisfy the bodily requirements.

Cattle, particularly heavy milkers, or those suckling calves, are most commonly affected; sheep, goats, and pigs occasionally, and rarely horses. In all animals the symptoms are similar.

Mineral salts are present in all animal bodies, and are essential for the development of the bones and for the proper performance of the functions of secretion and excretion. In adult bones, about 66 per cent. of the weight is composed of mineral salts, chiefly lime. To maintain the body in health, and ensure its perfect development, mineral salts are equally as essential as are proteids and fats.

Most soils contain a sufficiency of lime, which, in a soluble form, is drawn up by the grasses and plants and stored in the tissues. From this source, herbivorous animals procure the requisite supplies. In some soils the proportion of soluble lime is exceedingly low, and quite insufficient for animal requirements. But as it is essential that for the performance of its functional duties lime be present in the blood, to supply the immediate need, absorption from the bones occurs. Should this condition continue over a lengthy period, serious constitutional changes occur. As the presence of lime salts in the bones makes them stronger and better fitted to support the body weight, the gradual absorption would be attended by interference with locomotion. Though the animal may appear in fair condition, its movements are typical of the condition. With back arched, it moves in a stiff, constrained manner, as if uncertain and afraid, with a slightly rolling movement. As time goes on, these symptoms increase in severity, until eventually it cannot retain an upright posture. At no stage are there any noticeable symptoms of sickness.

Post-mortem examination reveals the bones soft and shell-like, with the interior honeycombed and filled with reddish marrow. The periosteum (fibrous covering of the bone) is easily detached. The bones are light, and easily broken. It is not unusual to find several of the ribs showing signs of recent fracture, probably from pressure in lying down. Treatment consists of supplying artificially the deficiency in lime salts. In small holdings top dressing the pastures with lime acts satisfactorily. But in large holdings, and where dressing the soil is not practicable, recourse is had to specially prepared "licks." A good mixture is composed of sulphate of lime (gypsum) and powdered sulphate of iron, of each one part; coarse salt, 4 parts; fine bone meal, 8 parts. A liberal supply should be placed in covered troughs in close proximity to the water supply.

VALUE OF THE SILO.

TEN YEAR-OLD SILAGE.

For a long time the Department of Agriculture and Stock has by precept and example, as well as by assistance of experts in the building and filling of silos, done all that is possible to induce owners of stock to preserve fodder, so plentiful in good seasons, against such a season as is now being experienced, when the growth of fodder plants is at its lowest ebb, and stockowners, especially dairy farmers, are at their wits' end to keep their cattle alive. There are, unfortunately, many who still neglect to make this simple provision for their stock.

As an example of the importance of the silo, we quote, from the Brisbane "Grazing Farmer," the following experience of Captain F. G. Waley, a breeder of stud cattle at Mowbray Park, Picton, N.S.W.:—

"I am thoroughly satisfied," he says, "that the experiment is a highly payable one, and the freedom from anxiety which it ensures cannot be over-estimated."

"That was the opinion expressed by Capt. F. G. Waley (N.S.W.) in 1907, after his first year's experience of conserving fodder in silos for his stud cattle at Mowbray Park, Picton. He had erected a nest of four tub silos, of a total capacity of 540 tons, and filled them with chaffed maize. Despite some delays, which tended to depreciate the quality of the silage, it proved a great stand-by in the dry season, which happened along in his first year.

"Those four silos were filled again in April, 1909—nearly 10 years ago—and the last of the reserve then put by is now being drawn upon. A sample of the silage—made from green maize cut in the milky-stage of the cob—now being used shows the fermentation to have been perfect, and the rich aroma is like that of brewer's malted grains. Another point is that portion of the contents of the silo now being emptied was used in the drought of three years ago, leaving 60 or 70 tons in the bottom. This at the time was topped off again with wet straw and properly weighted. The quality of this left-over portion has in no way deteriorated; in fact, like wine, it appears to have improved with age. The keeping quality was certainly improved, for it will keep for a couple of days after removal from the silo without heating.

"Now that the district is very dry and there is little natural feed, Captain Waley is drawing upon this 10-year-old reserve of succulent fodder. His milking cows are receiving a daily ration of 40 lb. of silage, with a little lucerne chaff and a handful of bran. On this the cows, he says, are milking even better than if on good grass. The silage is carted out and distributed in the paddock to the young stock, which simply rush it and lick up every particle.

"An experience of this sort is a telling object-lesson, especially to dairy farmers. As Captain Waley puts it, 'it shows what one can do by taking advantage of the good years to store up a reserve of fodder, which, while it costs nothing to keep, even improves year after year, and is invaluable when a drought comes along, like the present.'"

The Orchard.

THE CASSABA MELON.

Mr. H. A. Adams, Yalleroi, writes in praise of the Cassaba melon, which we described and illustrated in this journal in April, 1917. The seed was brought to Brisbane by Mr. W. H. Mobsby, of the Agricultural Department, from San Francisco, and he was successful in raising several plants which fruited, and he distributed seed to applicants in several districts in this State. The fruit ripens in the United States in July, and continues bearing and ripening all the summer and autumn until the frosts come. Mr. Adams says that he planted the seeds sent to him under the name of either White Africa, Golden Hybrid, or Santa Claus. About the middle of October they began to grow rapidly. The growth was so wonderful that he eased off the water—in fact, the plants had no water afterwards except by soakage. The first melons were cut in December, on Christmas Day. The largest turned the scale at 22½ lb., and the lightest weighed 10¼ lb. After numbers of fruits had been cut off the vines, they bore a second crop.

"Other rock melons," says Mr. Adams, "are not in it with the Cassaba. The flavour of the latter is superb." Mr. Adams will be pleased to send to any readers of the journal interested in fruitgrowing a few seeds if they write to him and send stamped envelope for reply.

One noticeable feature about these melons is that the ladybird will not attack them as they do other classes of rock melons. The seed was obtained from Mr. B. Harrison, Burringba, New South Wales, and Mr. Adams also received some from Mr. Mobsby.

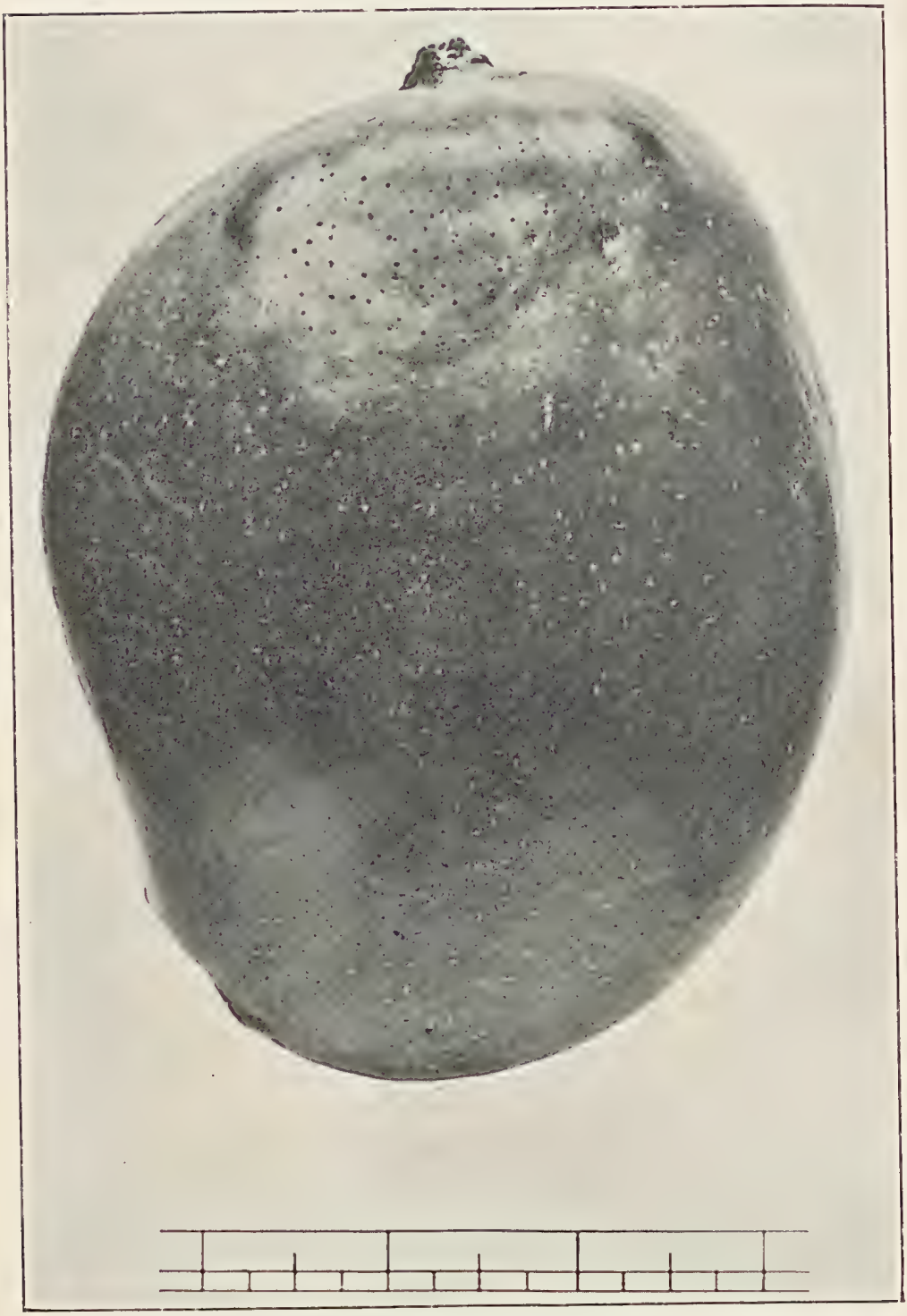


PLATE 6.—MANGO (LANGRA TYPE).

MANGO (LANGRA TYPE).

We here give an illustration of a mango grown by Mr. W. Pacey, Indooroopilly. The average weight of the mangoes is said to be about 2 lb. Not having seen the fruit, except as it came from the tree, we cannot give any opinion on its flavour, freedom from fibre, &c. The tree producing these fruits is eighteen years old, and this year has borne about ten dozen of the size figured. The seed is also here illustrated.

Plate 7.—Seed of Mango (Langra Type).

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1919.

The competition has now reached an interesting stage. In the heavy section there is a great fight for the premier position between the Nobby Poultry Farm and D. Fulton's pens. Nobby Poultry Farm's D bird, which had not laid since 5th November until she commenced on 29th January, should help her owner's chance if she sticks to her work. The birds of both the above owners look well, with the exception that Fulton's C bird shows signs of an early inclination to broodiness. The positions in the heavy section have every appearance of being altered considerably next month, as the pens scoring best for January are having birds removed for broodiness, whilst those giving a poor account of themselves for the month have freshened up after broodiness, and look fit for a good month during February. In the light section the laying has been very uneven. About the middle of the month the output of the Dixie Egg Plant's pen dropped considerably, three birds ceasing for several days. The pen, however, rallied splendidly, laying 35 eggs in the last seven days. That a competitor does not always select his best birds to represent him in the competition is very apparent in some cases, and the drones competing must be very annoying to the owners. Range Poultry Farm's A bird, which replaced one that was destroyed for dropsy on 12th October, has 81 eggs to her credit for 112 days of very trying weather. If only this bird had been selected in place of the original A bird, the owner's position would, no doubt, have been bettered. Quite a number of pens show drones at the present time, and some comment on this subject will appear in the final report. Several birds are now moulting, several of which are still adding slowly to their score. All the pens are now on the new site. Those removed have had a check, but have taken it much better than we anticipated. Quinn's Post Poultry Farm's B bird died from apoplexy during the month, and several other birds have been treated for troubles caused by the excessively hot weather and the drought conditions. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns ...	116	1,373
*G. W. Hindes	Do.	118	1,297
*E. Chester	Do.	104	1,277
*Tom Fanning	Do.	122	1,240
*W. Becker	Do.	109	1,213
*C. P. Buchanan	Do.	93	1,198
*Mrs. L. Henderson	Do.	118	1,191
*Geo. Prince	Do.	96	1,189
*G. H. Turner	Do.	91	1,184
*W. Lyell	Do.	105	1,175
*G. Howard	Do.	83	1,164
*E. A. Smith	Do.	105	1,151

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS—*continued.*			
*L. G. Innes	White Leghorns ...	102	1,136
*Dr. E. C. Jennings	Do.	119	1,134
*Oakland Poultry Farm	Do.	100	1,133
*C. Knoblauch	Do.	97	1,121
*R. Holmes	Do.	89	1,117
*Quinn's Post Poultry Farm	Do.	104	1,093
*Range Poultry Farm	Do.	112	1,091
*O.K. Poultry Yards	Do.	84	1,082
*Thos. Taylor	Do.	104	1,081
B. Casweil	Do.	80	1,079
J. J. Davies	Do.	101	1,077
*Mrs. A. T. Coomber	Do.	111	1,055
*J. M. Manson	Do.	132	1,052
*Homalayan Poultry Farm	Do. ...	107	1,032
H. Fraser	Do.	74	1,028
Mrs. L. F. Anderson	Do.	127	1,022
*Mrs. R. Hunter	Do.	114	1,001
Mrs. A. G. Kurth	Do.	107	988
*J. Zahl	Do.	86	981
Geo. Trapp	Do.	122	962
O. W. J. Whitman	Do.	87	961
*C. Porter	Do.	75	953
H. B. Stephens	Do.	110	939
*T. B. Hawkins	Do.	91	938
Shaw and Stevenson	Black Leghorns	88	917
*J. W. Newton	White Leghorns ...	75	907
S. Wilkinson	Do.	72	904
Progressive Poultry Pens	Do.	87	901
H. F. Britten	Do.	84	890
B. Chester	Do.	91	890
P. O. Oldham	Do.	93	880
G. Williams	Do.	67	879
R. T. G. Carey	Do.	83	877
W. A. Wilson	Do.	89	841
A. W. Walker	Do.	76	806
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons ...	96	1,216
*D. Fulton	Do.	134	1,158
*R. Burns	Do.	111	1,102
*E. F. Dennis	Do.	118	1,072
*E. Morris	Do.	82	1,070
*A. E. Walters	Do.	69	1,064
*Mars Poultry Farm	Do.	109	1,041
T. Hindley	Do.	67	1,041
*W. H. Reilly	Chinese Langshans ...	104	1,010
*W. Smith	Black Orpingtons ...	87	992
A. Shanks	Do.	103	986
E. M. Larsen	Do.	116	975
*J. W. Macrae	Do.	76	930
T. W. Lutze	Do.	88	910
*F. A. Claussen	Rhode Island Reds ...	63	775
Jas. Fitzpatrick	Do.	84	726
H. Puff	Do.	77	720
W. J. Mee	Black Orpingtons ...	44	710
Totals	...	6,228	66,899

* Indicates that the pen is taking part in single hen test.

DETAILS OF SINGLE HEN TESTS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	203	222	254	210	228	256	1,373
G. W. Hindes	245	212	203	222	214	201	1,297
E. Chester	226	206	203	228	213	201	1,277
T. Fanning	217	195	226	168	218	216	1,240
W. Becker	203	208	185	221	185	211	1 213
C. P. Buchanan	171	205	205	200	215	202	1,198
Mrs. L. Henderson	208	177	201	167	227	211	1,191
Geo. Prince	177	218	189	219	193	193	1,189
G. H. Turner	138	147	225	217	255	202	1,184
W. Lyell	190	216	211	187	189	182	1,175
Geo. Howard	190	183	207	220	176	188	1,164
E. A. Smith	174	219	192	190	199	177	1,151
L. G. Innes	206	211	248	126	142	203	1,136
Dr. E. C. Jennings	161	237	202	173	195	166	1,134
Oakland Poultry Farm	164	196	205	195	198	181	1,133
C. Knoblauch	205	181	207	176	158	194	1,121
R. Holmes	204	208	177	178	169	181	1,117
Quinn's Post Poultry Farm	221	172	170	142	214	174	1,093
Range Poultry Farm	114	224	165	200	192	196	1,091
O.K. Poultry Yards	160	198	200	162	195	167	1,082
Thos. Taylor	147	196	183	170	192	193	1,081
Mrs. A. T. Coomber	162	201	177	189	136	190	1,055
J. M. Manson	217	189	210	152	133	151	1,052
Homalayan Poultry Farm	201	172	158	146	187	168	1,032
Mrs. R. Hunter	157	174	116	173	191	190	1,001
J. Zahl	204	160	182	184	150	101	981
C. Porter	145	169	164	168	110	197	953
T. B. Hawkins	188	132	176	146	145	151	938
J. W. Newton	177	205	109	122	169	125	907
HEAVY BREEDS.							
Nobby Poultry Farm	240	213	193	115	220	235	1,216
D. Fulton	237	182	178	179	150	232	1,158
R. Burns	164	191	155	173	235	184	1,102
E. F. Dennis	213	165	181	121	203	189	1,072
E. Morris	154	169	193	216	186	152	1,070
A. E. Walters	155	198	138	201	195	177	1,064
Mars Poultry Farm	186	190	165	178	159	163	1,041
W. H. Reilly	175	183	176	137	144	195	1,010
W. Smith	227	169	119	162	142	174	993
J. W. Macrae	109	133	171	160	183	174	930
F. A. Claussen	131	130	133	139	137	105	775

SELECTION.

THE STANDARD FOR UTILITY BREEDS AS ADOPTED BY THE NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION OF AUSTRALIA.

GENERAL APPEARANCE.—Bright, active, and healthy. The first essential—a well-developed, vigorous constitution, giving evidence of ability to transmit similar qualities.

Comment.—There is little doubt that the "ground" selection, *i.e.*, choosing the birds by appearance first, is the most valuable part of the business, for if the bird does not please the eye, she or he has no right in the breeding pen. To breed from an unhealthy, undersized, or poor constitutioned bird, merely on pedigree or performances, is only to court disaster.

Head.—Rather long in light breeds, and lean, narrowing somewhat at the back of the skull. Heavy breeds shorter in skull, and fractionally deeper.

Comment.—Fineness of skull is imperative for a good layer. Coarseness in skull is not commensurate with heavy laying. The skull will thicken with age, and it is desirable it should be as fine as possible at the back, just where it joins on the vertebræ of the neck. The heavy breeds are naturally shorter skulled (though deeper through), and the tendency to breed longer skulls in heavy breeds should be sternly suppressed, the snaky-headed ones, ultimately breeding weaker constitutioned birds, are liable to moult earlier, and less likely to lay through the moult.

Eyes.—Full and bright; colour, rich orange red, except in the cases of certain breeds as Black Orpington, Langshan, Minorca, &c., where such eyes should be dark brown, as almost to appear black.

Comment.—It is said of human beings that the eyes are the windows of the soul. Certainly, with utility fowls, roundness and prominence of the eyes are indicative of vitality and fecundity. In light breeds the straw-coloured eye gives a sour appearance, and is indicative of lack of constitutional vigour. With age, the eye sinks into the skull, hence the desirability to avoid any measure of space from the eye to the back of the nostril, tending to increase the orbital cavity, and later on to accentuate the sunken appearance.

Face.—Bright and clean; free from feathering.

Comment.—The bright red colour of the face indicates a robust constitution and sound general health. Experience has shown that the best layers are invariably "clean faced," *i.e.*, free from face feathering.

Comb.—Thin and fine in texture, thickening as little as possible towards the base. Dubbing to be recognised in the case of second season or older roosters in the light breeds.

Comment.—Heavy laying and coarseness cannot go together, but the comb thickens with age, and also with the use of forcing foods, such as meat; in consequence of which, stud roosters, particularly when meat fed to increase vigour, will develop very large combs. A considerable drain on the system is entailed by supplying the necessary vigour, in the shape of blood, to support such comb; consequently, stud breeders usually remove the comb in order to increase vitality, and consequent fertility, during the breeding season. Whilst to those experienced, the operation of removing the comb—dubbing—is simple, it is one rarely undertaken by the farmer; consequently the stud breeders have mostly adopted the habit of sending out cockerels already dubbed.

Wattles.—Thin, and of finest texture.

Comment.—As in the case of the comb, the fine quality is eminently desirable. The wattles, which grow to a considerable size in the case of roosters, are also removed by some breeders along with the comb, and although somewhat altering the appearance of the bird, is rather an advantage on a farm where there are a number of roosters, some of which may be rather pugnacious.

Neck.—Fine and fairly long.

Comment.—Here again the reiterated desire for fineness and quality asserts itself. A short-necked bird is almost invariably thick-necked.

Body.—Long, deep, and wedge-shaped, similar to that of the milch cow; wide across the saddle.

Comment.—However good a hen is, if small and undersized, we would prefer not to breed from her, as strength and soundness of constitution are imperative for subsequent stud purposes. Spring of rib is also important; a flat-sided bird lacks constitution.

BREASTBONE.—Straight and fine.

Comment.—A crooked breastboned bird should be rejected for breeding purposes, this being an indication of hereditary weakness, and although it may have been caused by the bird being allowed to perch at too young an age, before the bone had hardened, there is nothing to indicate which is the real cause of this deformity.

PELVIC BONES.—Thin, pliable, fairly long and straight, set at considerable distance from the point of breastbone.

Comment.—But little importance can be attached to the distance between the bones themselves, as so much depends upon the proximity to the laying of the next egg. Just as in the case of the cow about to calve, we notice a relaxation, *i.e.*, "giving" of the bones, so do the pelvic bones widen for the laying of the egg in the case of the hen. Fineness of the bones is a distinct indication of quality, and although there is, with age, a gradual thickening of the bones, it is usually more marked in poorer layers. It is by no means uncommon to find one bone thicker than the other, in which case we have usually noticed that the right pelvic bone is the thicker of the two. Incurvation is commonly met with, and this may easily be caused by overcrowding in the brooder, when the bones are easily distorted. The distance from the breastbone to the pelvic bones is of considerable importance, as without good space there, there must be a small abdominal cavity. The advantage of this space is to leave plenty of room in the hen for the development of a number of yolks of a fairly even graduation, and so maintain a weekly output of five or six eggs; with a narrow space, fewer yolks can develop at a time. This is a strong argument in favour of handling the male bird, which is, unfortunately, not yet a common enough practice. "Like begets like," and using a narrow-spaced rooster will inevitably result in a certain proportion of narrow-spaced birds amongst his stock.

SKIN.—Texture of skin of abdomen to be of thinnest and finest quality; very elastic.

Comment.—The texture of the skin of the abdomen varies in accordance with the laying condition of the hen, but fineness and pliability are very desirable. A dairyman will frequently in the market test the fineness and pliability of the skin on the ribs of a cow; any tendency to being hidebound, or even coarse skin, being a common cause of rejection.

LEGS.—Not high, and set well apart.

Comment.—Width between the legs is necessary for a bold and vigorous stance; a narrow-legged bird, if lanky, is likely to be knock-kneed and lacking in stamina. It is noticeable with the yellow-legged varieties that, after a period of laying, the yellow colouring gradually disappears, the best layers losing the leg colouring first. The colour returns, however, when the bird ceases laying and moults.

TAIL.—Full and flowing, not set at too high an angle, with good sickle and hackle feathers.

Comment.—While the carriage of the tail has little or no effect upon egg production, a high tail carriage, or "squirrel tail," detracts greatly from the bird's appearance.

FEATHERS.—Profuse, but close and flat on the bird.

Comment.—The tighter or closer feathered the bird is, the warmer she will be in the winter, consequently requiring less of the food consumed to maintain the body heat, and thereby rendering more available for egg production. The loose-feathered bird is colder, and more liable to moult earlier, and is also much more likely to go broody. In connection with the moult, a good deal depends upon the nature of the moult. A good layer, tight-feathered, will go bare and red about the head, but moults gradually, causing less drain on the system of the bird, and enabling her to continue laying. The full "quill" moult leaves the bird colder—a drain, consequently, upon the food supply—and constitutes a further drain for the formation of a complete set of new feathers all at the one time.

Dairying.

CALF FOODS.

By J. C. Brunnich, F.I.C., Agricultural Chemist.

The economic feeding of calves, aiming at the rearing of strong, healthy animals, without the use of cow's milk, is one of the biggest problems of the dairy farmer and stockbreeder, as good stock and superior milkers can never be made out of poorly fed calves.

The use of whole milk, undoubtedly the best food for young calves, is, on account of its great value, greatly restricted. In the districts with butter factories, skim milk for the feeding calves is available; in districts with cheese factories only, whey can be returned to the farmer; and in districts with condensed milk factories and where milk is produced for town supplies, a part of the whole milk, as much as can be spared, must be used for the calves.

In all these cases the food must be supplemented with concentrates, and with careful choice and use of such foods good results can be obtained.

When properly fed a thrifty calf should gain from 1½ to 2 lb. daily in weight for the first 4 to 6 months, and when feeding with whole milk, of average quality, not too rich in fat, for every 1 lb. increase in weight about 1 lb. of milk solids are required, or for the average daily increase of 1½ lb. of young calves about 11 lb. (or about 1 gallon) of whole milk are necessary. Very young calves require from 5 to 6 lb. of milk daily.

Skim milk is a much more nitrogenous food than whole milk, and must therefore be supplemented by carbonaceous concentrates, containing a fair amount of easily digestible oils or fat. After a calf is from two to four weeks old skim milk may gradually replace whole milk, so that after about ten days skim milk alone is used, and a calf six weeks old may get from 18 to 20 lb. (1¾ to 2 gallons) daily.

The skim milk must be warmed and fed at about blood heat until the calf is four months old.

Whey contains only small amounts of nitrogenous matter and fat, and must be supplemented by concentrates rich in protein. It is only a poor food for calves, and must be used with care, and as fresh as possible.

A great many food mixtures have been experimented with and are recommended for calf feeding, like ground oats, ground oats and bran, corn meal, bran and linseed meal, &c., &c. In many cases corn meal alone has been used, or mixed with pollard, and particularly kafir corn meal has been used with excellent results.

Cottonseed meal cannot be recommended as a calf food, but all other oilcakes like linseed, cocoanut, and peanut cake and meals are excellent foods, as well as the by-products polly meal, germ meal, maize oil meal, obtained from corn.

Supplementing skim milk the following amounts of suitable concentrates, divided over two or three meals, should be used daily:—

For Calves 3 weeks old, about 5 oz.
For Calves 6 weeks old .. ½ lb.
For Calves 2 months old .. 1 lb.
For Calves 3 to 5 months old 2 lb.

A large number of calf foods are on the market, and in spite of the very high price asked for such foods, and the most extravagant claims advanced by the manufacturers, not one can be considered an absolute substitute for milk.

Farmers are frequently induced to buy such foods, notwithstanding the exorbitant price, deluded by glowing descriptions of such foods, their claimed value as complete substitutes for milk, and their supposed action as preventives for all sorts of ailments and diseases.

In a few cases fair results with the use of such proprietary foods have been reported, but such results are frequently based on comparisons between the systematic use of a fair amount of such foods and the spasmodic use of little or no food, which was, perhaps, quite unsuitable, whereas by feeding the calves with homemade mixtures of meals excellent results would have been obtained.

Similar troubles with proprietary calf and stock foods will exist anywhere if the sale of such stock foods is not regulated by legislation.

It will be of interest to quote here the results of calf-feeding experiments made a few years ago in Ireland, which were published in the "Reports of Proceedings under the Fertilisers and Feeding Stuffs Act, 1906," by the Department of Agriculture and Technical Instruction for Ireland. The results of these experiments warranted the publication and wide distribution of the following poster:—

Department of Agriculture and Technical Instruction for Ireland.

Caution.

CALF MEALS.

FARMERS
are
WARNED
that
INFERIOR and Expensive Calf Meals are at present being SOLD in Ireland.

Read Leaflet No. 54.
&c., &c.

For these feeding experiments a calf meal described as a "milk substitute," was used in comparison with a home-made calf meal mixture, recommended by the Department, and consisting of 2 parts of maize meal, 2 parts oatmeal, and 1 part crushed linseed. The "milk substitute" was sold at the exorbitant price of 28s. per cwt., and according to analysis made, contained 20.56 per cent. of crude proteids and 4.09 per cent. of crude oil or fat, and was only worth about 8s. per cwt.

For this experiment eight young calves, as nearly alike in age and type as possible, were selected and divided into two lots of four each. Lot No. 1, was fed on "milk substitute" in accordance with the directions of the manufacturers, and Lot No. 2 with the departmental home-made meal.

During the first fortnight both lots were fed on whole milk and the increase in weight was as follows:—

	Lot No. 1.	Lot No. 2.
	lb.	lb.
1st fortnight	67	53

The comparative trials now commenced showing the following increases:—

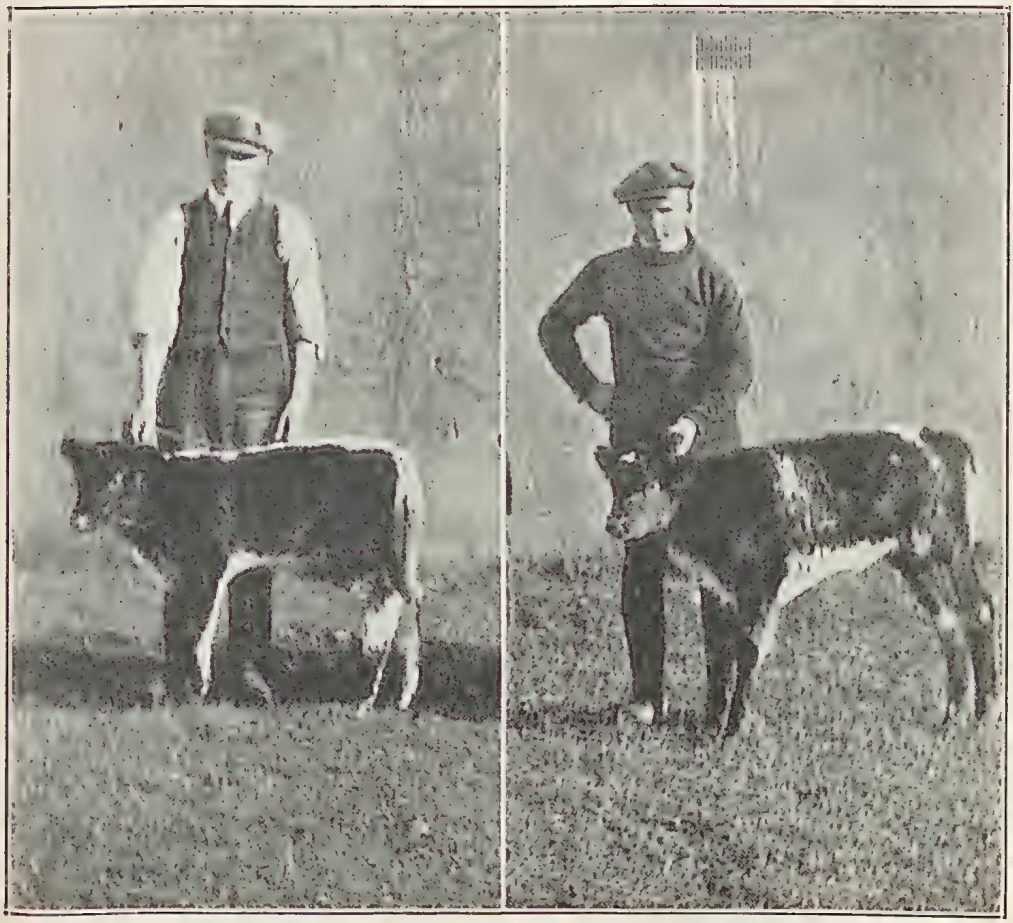
	Milk substitute.	Home-made meal.
	lb.	lb.
2nd fortnight	6	85
3rd "	11	87
4th "	30	89
5th "	17	92
6th "	15	81
7th "	29	104
8th "	26	103
9th "	18	88
10th "	36	114
Total	188	843
	£ s. d.	£ s. d.
Total cost of feeding ..	9 1 2¾	10 8 3¼;
or cost per cwt. live weight increase	3 19 7	1 6 0

A second series of experiments with six calves, three of which were fed with "milk food for calves" and three with separated milk and abovementioned home-made meal, were just as interesting and instructive.

The increase in weight during the first twelve days was exactly 66 lb. in each lot. After eight weeks of trial the increases were:—

Lot I. (fed with milk food) .. .. 13 lb.
Lot II. (fed with home-made meal) .. .. .. 234 lb.

The cost of the feeding for the eight weeks amounted to £2 19s. 3d. for Lot. I. and £3 3s. 6d. for Lot. II.



Calf No. 1. Calf No. 3.

Plate 8.—Calf-feeding Experiment.
Photograph taken at commencement of Experiment.

Calf No. 1. Calf No. 3.

PLATE 9.—CALF-FEEDING EXPERIMENT.
Photograph taken at conclusion of Experiment.

The cost per cwt. of live weight increase works out at £25 10s. 5d. for Lot I., and £1 10s. 5d. for Lot II.

Copies of the photographs taken before and after conclusion of the trial strikingly show the difference in the appearance of the calves.

The veterinary surgeon reported the calves of Lot I. to be unhealthy, emaciated, dull, and depressed, whereas the calves of Lot II. were healthy and thriving.

The calves of Lot II. were absolutely unsaleable. A continuation of the feeding of Lot I. with "milk food" would have been followed by fatal effects, and the calves were therefore put back on whole milk and home-made meal; the increase in weight in four weeks amounted to 99 lb., which shows that the animals began to thrive as soon as they received suitable feeding.

A good number of dairy farmers recommend to feed concentrates, like crushed oats, oatmeal, and pollard, corn meal, kafir corn meal, &c., in a dry form, after the calves are from four to six weeks old. This teaches the calves to eat, and readily appreciate grass, hay, and even silage and roots.

A calf-feeding experiment carried out at the Woburn Experiment Farm, in England, 1912-13, shows the advantage of dry feeding.

Twenty Shorthorn bull calves were selected and fed for the first three weeks on whole milk, and then divided into five lots of four calves each, fed as follows:—

Lot 1.—Cod liver oil and separated milk.
Lot 2.—A purchased "calf meal" and separated milk.
Lot 3.—Gruel from linseed and oatmeal and separated milk.
Lot 4.—Whole milk.
Lot 5.—Crushed oats (dry) and separated milk.

The last lot gave the highest gain in live weight at the lowest cost per lb. of increase during the nine weeks' trial. The next highest gain was with whole milk, but at greatly increased cost.

At the end of the trial the calves were turned out and all fed alike on separated milk, with a little linseed cake and crushed oats. On conclusion of the experiments Dr. Voelcker reports "that not only did the crushed oats and separated milk feeding (giving to each calf 1½ gallon of separated milk and 1 lb. of crushed oats daily) give the highest gain at lowest cost (1.9 lb. daily at a cost of 2.52d.) during the feeding of nine weeks with the special foods, but that subsequently, when the calves were turned out on the field and all fed alike, the gain of live weight continued to be higher with this feeding than with any other food. This improvement was maintained for a period of seven months after the special feeding had been dropped (the average gain per head daily for the whole period of seven months was—Lot 1, 1.74 lb.; Lot 2, 1.62 lb.; Lot 3, 1.84 lb.; Lot 4, 1.94 lb.; and Lot 5, 2 lb.)."

The next best results were obtained with whole milk calves, and they looked the best of all the lots, having more "bloom" on them than any of the others. The crushed oats lot similarly stood out above the remainder, and undoubtedly the poorest of all were the "calf meal" lot.

The feeding problem becomes more difficult when no separated milk is available, and it is therefore of interest to record that Mr. Cochrane, of Wyreema, had good results with rearing of sturdy and vigorous calves by using a small amount of whole milk and a meal made by mixing two parts of wheat meal and one part of maize oil meal.

The Standard Dairy Company issued a circular to the suppliers recommending the adoption of Mr. Cochrane's method of feeding:—

"For each calf mix from ½ to 1 of the 'meal' to a fairly thick paste with cold water, then add boiling water gradually, stirring the while, so as to make 1 gallon of food; add to this 2 pints of milk and allow to cool. This is a sufficient daily ration for each calf, and is suitable until the calf is two months old; the quantity of added milk is then reduced, feeding on green foods or hay commenced and gradually increased with a proportional decrease in the amount of 'meal' until, at the age of three months, no 'meal' food is necessary."

The amount of food given is unquestionably the minimum amount on which any calf could be reared, as with the lower amount of meal the calf gets only ¾ lb. of solid matter and with the higher amount only 1¼ lb., so that the average daily increase of live weight of 1½ lb. cannot possibly be obtained.

A comparison of the various methods of feeding described clearly shows that no hard-and-fast rule can be laid down for the feeding of calves, and much is left to the judgment of the feeder, who must study local conditions and individual requirements.

From a practical point of view, the dairy farmer will naturally ask what concentrates are available for calf feeding and what is their relative cost.

The principal calf-food meals on the market have been analysed, as well as the most important concentrated foodstuffs, and the results of analysis tabulated and given herewith. The value of a food depends principally on the amounts of digestible protein, or flesh-forming nutrients, the digestible carbohydrates and fats, or heat and fat producing nutrients, and lastly, on the mineral matter contained in the ash, supplying the necessary amounts of lime, phosphoric acid, salt, &c.

The composition of the home-made meal recommended by Department of Agriculture and Technical Education of Ireland may be taken as a basis for the feeding of calves in combination with skim milk, and its composition is closely approached by the mixed meal used by Mr. Cochrane and also by a high-grade pure oatmeal. Mr. Cochrane's mixture is rather low in fat, and its chief drawback lies in the fact that it contains a very insufficient amount of lime.

The variation in the composition of the commercial calf foods is quite extraordinary, as the amounts of digestible protein vary from 5¾ to 21 per cent., and the amounts of fat from ¾ to 7½ per cent. Only two of the foods contain a barely sufficient amount of fat, and only one is a little superior to ordinary pollard, and not one of them can be called a "milk substitute." One of the foods actually contains nearly ⅓ of its weight of ash, chiefly consisting of common salt.

But when considering the actual cost of the foods, the results of comparison are absolutely startling. To compare the actual relative pecuniary values, the unit values of food are first calculated by multiplying the most valuable constituents, digestible protein and fat, by 2¼, and then adding the amount of digestible carbohydrates, including digestible fibre. Dividing the food units into the cost of food per ton (average wholesale cash prices) the cost per unit is obtained.

Even with the abnormal conditions existing at the present time, the prices per unit for the ordinary concentrated foods are not too high, and compare favourably with the prices existing elsewhere. But the price asked for all the commercial calf foods is absolutely exorbitant and from three to four times their real value.

Calf food C, for instance, which has to be absolutely condemned for the fact alone that it contains less than ¾ per cent. of fat, costs actually 8s. 3d. per unit, which is higher than the most expensive and valuable of calf foods—cow's milk.

COST OF CALF FOODS, MEALS, ETC.

—	Food Units.	Average Normal Cost per Ton, 1914.	Cost per Unit.	Present Cost per Ton, 1918-19.	Cost per Unit.	English Price, May, 1916.*
		£ s. d.	s. d.	£ s. d.	s. d.	s. d.
Calf Food A ..	87·0	?	?	23 10 0	5 5	..
,, B ..	86·8	21 12 0	5 0	21 12 0	5 0	..
,, B2 ..	76·1	?	?	21 12 0	5 8	..
,, C ..	93·4	?	?	38 1 6	8 3	..
,, E ..	90·7	35 0 0	7 9	35 0 0	7 9	..
,, F ..	105·4	40 0 0	7 7	40 0 0	7 7	..
Linseed (crushed)	130·2	25 0 0	3 10	32 12 0	5 0	..
Meggitt's Meal ..	108·8	?	?	9 10 0	1 9	1 11
Maize Meal ..	91·8	10 0 0	2 2	20 0 0	4 4	2 10
Sunlight Oilcake ..	96·7	?	?	10 0 0	2 1	2 0
Key Meal ..	100·5	?	?	7 0 0	1 5	..
Polly Meal ..	105·3	?	?	10 12 0	2 0	2 5
Bran	81·8	4 15 0	1 2	7 15 0†	1 11	1 11
Pollard ..	89·5	5 2 6	1 2	7 15 0†	1 9	2 1
Milk ..	22·5	?	?	9 0 0‡	8 0	..

* According to Professor T. B. Wood in "Science and the Nation."

† State Produce Agency price, Feb., 1919.

‡ Milk at 10d. a gallon, price paid by condensed milk factories.

It is very fortunate that the farmer has the remedy to obtain cheap calf foods in his own hands, as the concentrated foods like linseed meal (Meggitt's meal), coconut oil cake (Sunlight oil cake and Key meal), by-products from corn (polly meal, maize oil meal, &c.), and even bran and pollard, are obtainable at very reasonable rates.

COMPOSITION OF CALF FOODS CONCENTRATES, MEALS, MILK, ETC.

—	ANALYSES OF FOODSTUFFS.										DIGESTIBLE NUTRIENTS.							—
	Water.	Crude Protein.	Carbohydrates or N Free Extract.	Crude Fibre.	Crude Fat.	Crude Ash. Total.	Crude Ash. Insoluble.	Crude Ash. Lime, CaO.	Crude Ash. Phosph. Acid, P_2O_5.	True Protein.	Carbohydrates or N.F.E.	Fibre.	Fat.	Nutritious or Album. Ratio.	Starch Value.	Food Units.	
	%	%	%	%	%	%	%	%	%	%	%	%	%	1 ÷			
Calf Food A	8·51	12·50	63·43	5·67	5·45	4·44	·46	·14	·74	8·00	51·38	1·77	5·49	8·6	73·0	87·0	
„ B	10·81	11·13	67·39	4·70	4·09	1·88	·34	·11	·50	8·73	54·58	1·55	3·52	7·6	72·1	86·8	
„ B, 2nd Sample ..	9·75	10·91	67·39	3·15	3·30	5·50	2·91	·32	·67	5·76	54·59	1·04	2·84	10·8	67·3	76·1	
„ C	9·47	29·25	45·07	8·60	·83	6·78	·87	·39	1·90	20·90	36·51	2·84	·71	2·0	59·8	93·4	
„ D	8·27	10·31	30·65	17·60	5·20	27·97	2·13	·56	·59	7·48	24·83	5·81	4·47	5·5	47·7	59·5	Ash contained 18·5 per cent. of salt
„ E	8·38	17·75	58·64	4·40	4·93	5·90	·32	·84	1·49	12·45	47·50	1·45	4·21	4·7	69·9	90·7	
„ F	7·51	19·25	53·24	6·39	8·69	4·92	·26	·73	1·66	12·61	53·12	2·11	7·47	5·8	83·8	105·4	
Home-made Meals—																	
Irish Mixed Meal	9·25	14·50	54·82	7·28	10·91	3·24	1·06	·34	·52	8·87	46·70	3·08	9·16	8·0	77·6	97·7	2 p. oats, 2 p. maize, and 1 p. linseed
Cochrane's Meal	8·40	14·03	64·50	4·35	7·00	1·72	·06	·08	·64	9·91	54·18	1·78	5·25	6·9	77·0	93·9	2 p. wheat and 1 p. maize oil meal
Concentrates and Meals—																	
Linseed, crushed	6·65	18·31	32·08	6·38	32·40	4·18	·68	·50	1·19	12·23	24·70	3·64	28·51	7·7	104·9	130·2	
Linseed Meal, Meggitt's ..	9·50	26·63	35·86	9·70	11·85	6·46	1·24	·67	1·72	19·86	27·61	5·54	10·42	2·9	74·0	108·8	
Maize Meal	10·65	10·50	67·57	5·21	4·55	1·52	·06	·13	·40	7·37	62·84	3·02	3·00	9·9	79·4	91·8	
Sunlight Oilcake	10·80	17·50	44·25	12·85	9·00	5·60	·28	·67	·88	12·89	36·29	7·32	8·37	4·9	74·5	96·7	
Key Meal	8·75	18·37	43·45	13·35	9·90	6·18	·14	·50	·88	14·06	35·63	7·61	8·45	4·5	75·5	100·5	
Polly Meal	8·05	19·81	61·31	5·50	3·65	1·68	·26	·16	·54	15·92	57·02	3·19	3·14	4·2	81·8	105·3	
Bran	11·00	15·90	55·40	8·20	4·90	4·60	·18	·36	2·00	11·40	41·60	2·20	3·80	4·6	62·7	81·8	
Pollard	10·50	17·40	56·80	6·00	4·90	4·40	·17	·35	1·88	12·40	46·00	2·00	4·20	4·7	68·9	89·5	Average analyses
Milk	87·2	3·6	4·8	..	3·7	·7	..	·17	·15	3·4	4·7	..	3·7	3·9	16·2	22·5	
Skim Milk	90·4	3·8	5·0	..	·1	·7	..	·17	·15	3·6	5·0	..	·1	1·4	8·6	14·3	
Whey	92·7	1·0	4·9	..	·8	·6	..	·15	·13	·9	4·9	..	·8	7·4	7·6	9·2	

Viticulture.

THE SEEDLESS RAISIN GRAPES.

The following notes on seedless grapes, by Frederic T. Bioletti, form the subject of Bulletin 298, issued by the University of California, will doubtless prove of interest to vignerons in Queensland:—

TYPES OF RAISINS.

The raisins of the world are of four main types: (1) of large size, made principally from the Muscat of Alexandria grape and known generally as *Muscat* or *Malaga* raisins; (2) of medium size, light coloured and seedless, made principally from the Sultanina grape and known generally as *Sultana* raisins; (3) of small size, dark coloured and seedless, made principally from the Black Corinth grape and known in English as *Currants;* (4) of various sizes, colours and qualities, and made from almost any vinifera varieties, and usually known as *Dried Grapes.* The last are not usually classified as raisins. There are numerous subdivisions and modifications of these types. This publication deals with the second and the third types.

Statistics.—The principal raisin-producing countries of the world are Greece, California, Turkey, Spain, and Australia. Their comparative importance is shown by the following figures:—*

WORLD'S PRODUCTION OF RAISINS IN 1913.

Principal types.	Country.	Tons.	Per cent. of total.
Muscats and Sultanas ..	California ..	65,000 ..	22
Currants	Greece ..	180,000 ..	60
Sultanas	Turkey ..	23,000 ..	8
Muscats	Spain ..	20,000 ..	7
Muscats and Currants ..	Australia ..	14,000 ..	5

The California crop increased from 40,000 to 128,000 tons (220 per cent.) between 1904 and 1915. During the same period, the crop of Australia increased 136 per cent., while that of Spain decreased 26 per cent. Those of Turkey and Greece were practically stationary. In 1916, California produced about one-half the raisins of the world.

VARIETIES.

Seedless raisins are made from four varieties of seedless grapes: Sultanina, Sultana, Black Corinth, and White Corinth. Other seedless or nearly seedless grapes are grown as table grapes and might be used for making seedless raisins but for the superiority of the varieties mentioned. These other varieties are: The Rose Sultanina, the Giant Sultanina, and the Black Monukka. Seedless raisins of a type peculiar to California are also made from the abortive, seedless berries ("shot grapes") which occur commonly on the Muscat of Alexandria and which are separated in the cleaning and grading of Muscat raisins.

The various seedless grapes and their uses are shown in the following table:—

SEEDLESS GRAPES AND THEIR USES.

Name of grape:	Use:
Sultanina	Sultanas of commerce
Sultanina, Rose	Table grape
Sultanina, Giant	Curiosity of collections
Sultana	Inferior Sultanas of commerce
Black Corinth	Currants
White Corinth	Inferior currants
Black Monukka	Table grape
Muscat ("shot grapes)	Seedless muscats

Sultanina.—Synonyms: Thompson, Thompson's Seedless (in California), Lady de Coverly (English hot-houses), Sultanieh, Oval-fruited Kishmish (Turkey, Palestine). This variety is grown in collections or in small quanities as a table grape throughout the Mediterranean region. It is grown largely in the Levant, more

* All statistics are quoted or calculated from those given by George Robertson in the Statistical Report of the State Board of Agriculture for 1916.

particularly in the warmer parts of Asia Minor, as a raisin grape. It appears to be widely distributed in Asia as far east as Persia and probably beyond. From it are made the genuine *Sultana* raisins of Smyrna.

It was brought to California in 1872 by Wm. Thompson, senr., of Sutter County, who obtained it from Ellwanger and Barry, of Rochester, New York, under the name of Lady de Coverly, a name by which it is known in English hot-houses. It was distributed here under the name of Thompson's Seedless to distinguish it from the Seedless Sultana, a grape grown more sparingly in the same Asiatic regions. Its name of Sultanina, by which it is known in most countries, or Sultanieh, as it is sometimes spelled, is derived from the town of Soultanieh in Persia.

Mr. Thompson deserved great credit for having introduced this valuable grape into California, but it seems hardly necessary or desirable to change the euphonious and appropriate name by which it has been known in most of the regions where it has been grown probably for hundreds of years.

The vine is remarkably vigorous, producing canes in rich soil often 30 ft. long. These canes are often comparatively thin and slightly flattened for a foot or so near the trunk and become rounded and much thicker in their middle portion. The joints are very long, and strong laterals are produced abundantly, especially when the growing shoots are pinched or topped.

The bunches are very large, conical, and usually well filled. The berries are oval, yellow, and small to under medium in size. They are perfectly seedless, without marked flavour, and low in acidity.

Rose Sultanina.—Synonym: Sultanina Rosea. This is a mere colour variation of the last with which it is identical in all respects but the colour of the fruit. It was imported from Italy by the United States Department of Agriculture in 1900. It is numbered 5616 (3921) in the list of plant introductions published by the Department. It is known in European vine collections and appears to have been brought to Europe from some part of Anatolia (Asia Minor).

Raisins have been made from it, but they are inferior in colour to those made from the ordinary or white Sultanina. As a table grape, it is very attractive when it attains its full, bright rose colour. In the hotter regions of the State, as in Imperial, Fresno, and Yolo counties, it remains white or only faintly pink and is less attractive in appearance than the ordinary form. It develops a most brilliant colour in Sonoma County, and probably would do so in any of the cooler grape-growing regions.

Giant Sultanina.—Occasionally, a vine of Sultanina is found showing a remarkable hypertrophy of all its parts. The berries are round and nearly as large as those of Muscat. The peduncles, canes, joints, pith, and leaves also show this enlargement. Vines obtained by grafting or rooting cuttings from this form retain its peculiarities. The vine appears to be a bud sport showing the characteristics of what the biologists call "gigantism." No indications have been found as to whether all the vines originated from a single parent vine or whether they had independent origins. All the specimens seen seem to be identical in their characters.

It is possible that this vine has given rise to the legend of a seedless Muscat. It has, however, none of the flavour or other characteristics of the Muscat and, in fact, in spite of its marked peculiarities, no one familiar with varieties of vines would fail to recognise it as a form of the Sultanina. It is now growing at the experiment vineyard at Davis, but the crops so far have been small and irregular. It appears to lack vigour and is somewhat difficult to propagate.

Similar cases of gigantism have been noted with Muscat of Alexandria, Flame Tokay, and Zinfandel. It seems probable that it is a variation similar to that of the Nectarine and that it may occur with any variety. All the varieties in which it has been noted are grown in large quantities, which would increase the chance of finding a very rare variation.

Sultana.—Synonyms: Seedless Sultana (in California), round-berried Kishmish (French ampelographies). This grape was introduced very early into California by Mr. West, a Stockton nurseryman. Under the mistaken impression that it was the variety from which the Sultana raisins of commerce were made, it was distributed under this name. This is unfortunate, as the name became fixed in popular use here before the Sultanina, the real variety producing Sultana raisins, was introduced.

The grape seems to have been introduced into Europe from Asiatic Turkey. In Turkish any seedless grape or raisin is called *Kishmish*, and two varieties are recognised, the "round-fruited," which we call the Sultana, and the "oval-fruited," which is the true Sultanina, and which we call the Thompson.

The vine resembles the Sultanina in its vigour and general aspect. It is a little less riotous in its growth and a little more inclined to be fruitful, even with defective pruning.

The bunches are very large, compact, and of a very characteristic shape. The central part is remarkably long and perfectly cylindrical, and the upper part very heavily shouldered. The berries are wider than they are long and slightly flattened at the apex. In flavour and colour, they resemble the Sultanina, but are inclined to have a higher acidity. A seed is found in an occasional berry.

Black Corinth.—Synonyms: Zante Currant, Panariti (?), Passerina nera (in Italy). This variety was early introduced into California and planted in various places in the Sacramento and San Joaquin valleys. Later introductions by the United States Department of Agriculture were widely distributed. Unlike the Sultanina, it was never largely planted, as no one until lately had been able to make it produce paying crops. By severe annual ringings of the main trunk, it has been made to produce satisfactorily in Australia, and fair crops have been obtained in the University experiment vineyards by grafting it on resistant stocks.

The vine is of great vigour, and the trunk will grow a hundred or more feet in length if given the opportunity. Under some conditions, apparently when it is allowed to grow to very large size, many or most of its berries grow large and develop seeds. In such cases, it is of no value as a raisin grape. It is from this variety that the so-called Zante or Greek currants are made.

The bunches are of medium size, compact, and cylindrical, with well-marked shoulders and sometimes winged. The berries are very small, no larger than elderberries, reddish black, round, and seedless. Occasionally a berry containing seeds is found.

White Corinth.—Synonym: Passerina bianca (in Italy). This variety resembles the last one in many of its characteristics. It is, however, more easily made to bear good crops, and several small vineyards of this variety have been in existence in the Sacramento Valley for many years. It will bear on its own roots and with the same treatment that succeeds with the Sultanina.

The vine is nearly as vigorous at the Black Corinth, the leaves are a little lighter in colour, and the fruit is white. The bunches are medium or a little larger than those of the black and more conical in shape. The berries are a little larger, intermediate in size between the Black Corinth and the Sultana. They are rounded and slightly flattened like the latter variety. They lack the flavour and acidity of the black. When dried they make an excellent currant, but not equal to the black. The dried fruit is intermediate between a currant and a Sultana, and while intrinsically of good quality, it must be marketed as a second-grade currant or Sultana.

Red Corinth.—Synonym: Passerina rosa (in Italy). This variety does not seem to have been introduced into California. Some vines called by this name are simply Black Corinth, which, owing to peculiarities of local soil or climate, do not develop their full colour.

Black Monukka.—This is a recent introduction of the United States Department of Agriculture. According to A. F. Barron, it came originally from India. It is the largest of the group, but is not perfectly seedless. It is an excellent table grape, and will probably ship well. It is not promising as a raisin grape.

Seedless Muscat.—There have been rumours for many years that a large seedless Muscat is grown in Chile, but no one has been able to obtain any for California. It is not likely that such a variety exists. A seedless grape is a defective grape, that is, one which has not developed the physiologically essential part of the fruit, the seed, and this defect seems to be correlated with small size. The seedless Muscats are grapes which have been imperfectly pollenised, and in some seasons they occur in large numbers on most bunches, but it is rare that they constitute all the berries of a bunch. This condition is called by French grape growers "millerandage," and by California grape growers "shot grapes." It occurs sometimes with nearly all varieties.

A CORRECTION.

In our statement of the Cotton Production in Queensland for the past four seasons, the amount of raw cotton received at the Departmental Ginnery in 1914 was set down as amounting to 94,445 lb. This should have read 9,445 lb.

Tropical Industries.

THE CULTIVATION OF SUGAR-CANE IN QUEENSLAND.

By Harry T. Easterby, General Superintendent, Bureau of Sugar Experiment Stations.

PART 1.

There are now so many persons in Queensland who in recent times have commenced the growing of sugar-cane without a great deal of knowledge of the subject, and so many others who write to the Bureau of Sugar Experiment Stations for information on the taking up of land and cultivating cane, that it is recognised that a Bulletin dealing with the topic is a necessity. In addition, there are proposals for settling many of our returned soldiers upon sugar lands, and instruction in canegrowing will be needed by them if such schemes are given effect to. It is further hoped that such a Bulletin will be of value to those who have been deriving their living from canegrowing for many years past. Until this Bulletin is issued, it is proposed to publish parts in the "Agricultural Journal."

The man who proposed to grow sugar-cane on a small scale should possess some capital—say, from £300 to £500. If he intends taking up a cane farm on the share system, his capital could be much less. For the purchase of large, well-equiped farms as going concerns, much more money is required, though even many of these are frequently sold to a good man for a comparatively low deposit, and the balance is repayable over a long term. This has been freely done on the Herbert and Johnstone rivers, particularly to Italians. In the case of returned soldiers, special terms will no doubt be granted.

(*a*) Taking up Virgin Scrub Lands.

It is now impossible to secure Crown lands in the vicinity of an existing sugar-mill. Large quantities of Crown lands in the tropical coastal areas of Queensland are eminently adapted for cane. The finest of these lands lie around the Tully, Hull, and Banyan country, and will eventually be used for sugar-growing as it is now proposed to connect this district with the South Johnstone Mill. The best an intending canegrower can do who wishes to commence at once on other than an established farm is to buy land from some private owner.

Before purchasing virgin scrub lands, the nature of the scrub growth, *i.e.*, whether dense or light, large or small, class of timber, whether land is level or ridgy and broken, the depth of soil and whether it is well watered should be taken into consideration. In the Northern sugar districts the scrub is mostly heavy, and consists of such trees as silky oak, bull oak, spurwood, milky pine, water gum, white beech, pencil cedar, maple, bean, china pine, sassafras, penda, Johnstone River hardwood, sour hardwood, lawyer vine, stinging tree, candlenut, yellowwood, lancewood, plum, red cedar, crowsfoot elm, walnut, rosewood, &c. Palm scrubs are not recommended.

The dense tropical scrubs with a good depth of soil should be selected as a rule as, although more costly to clear, the land is of much better quality and will be more permanent. Light red soils of a ridgy nature should not be taken in preference to dark chocolate soils of a level formation.

Southern scrubs are lighter in character than the Northern ones, and the timber usually consists of croton, hoop pine, yellowwood, milkwood, scrub ironbark, fig, white cedar, ash, flindersia, vines, maiden's blush, &c. The nature of the soil, its depth and colour, should be carefully ascertained before purchase.

(*b*) Forest Lands.

The best forest lands in North Queensland for sugar-cane carry Moreton Bay ash (or blackbutt as it is sometimes called), acacia, and cocky apple. Other forest country has ironbark, bloodwood, poplar gum, cabbage gum, blue gum, ti-tree, wattle, &c. Country covered entirely with poplar gum is usually shallow, with a stiff clay subsoil. Southern forest lands carry a good many of these trees, though not much poplar gum.

Having purchased land either carrying scrub or forest, the next business is the clearing, and the cost of this operation will vary considerably. In the heavy scrub soils the cost is usually very high. An example may be given from the actual experience of a South Johnstone grower:—

Brushing and felling, £3 10s. to £4 per acre.
Lumping and burning, £2 to £8, according to nature of burn.
Holing for cane plants, 3s. 6d. to 3s. 9d. per 100.
(Men can make from 400 to 450 per day.)

In this case 3,000 holes 14 in. x 9 in. x 9 in. were made per acre.

The land is then ready for planting, the remaining costs being given as under:—

Plants, £2 10s. per acre.
Labour planting £2 10s. per acre.
Road making, £1 10s. per acre.
Chipping, £5 to £10 per acre, according to season.

Cutting cane costs 6d. per ton more than on ploughed ground, the award rate for the North for 15 tons per acre and over being 6s. 9d.

Hauling out, 1s. 6d. per ton.

In the Babinda scrubs the cost of falling, lumping, holing, making roads, planting, fencing, and three chippings has been given at £33, exclusive, of course, of the cost of the land.

The cost of planting cane on the lighter scrubs in Southern districts would, of course, be much smaller, and has been given as under:—

	Per acre. £	*s.*	*d.*
Brushing, felling, clearing, lumping, and burning ..	3	10	0
Holing	2	10	0
Plants	2	0	0
Planting	2	0	0
Chipping three times	4	10	0
	£16	10	0

Srub lands, after carrying from three to five or more crops, are then usually stumped and put under the plough.

Forest lands are nearly always completely cleared, *i.e.*, they are at once stumped and put under the plough. The cost of clearing forest land varies a good deal, but an average figure would be about from £5 to £10 per acre, according to the nature of the timber. The cost of breaking up further ploughings, and planting of cane would, of course, be additional.

(*To be continued.*)

Science.

THE USE OF THE DIVINING-ROD IN LAND DRAINAGE.

By ARTHUR MORRY.

It sometimes happens that difficulty is experienced in the drainage of land or swampy ground; by reason of insufficient fall to a suitable outlet, surface or underground drains may often be carried great distances before an escape for the accumulated water can be found. Yet it is frequently the case that an outlet exists on the very spot where relief is sought, but this fact is not known through the lack of surface indications.

Geological formations as apparent on the surface do not enable the scientist to indicate underground streams, and although the geologist may occasionally succeed in rendering help to the agriculturist in this connection, it is the so-called water-diviner or hydro-geologist that is capable of rendering most help and of solving what are sometimes very difficult problems.

What this mysterious power is science has not yet discovered; but facts are stubborn things, and proofs of its success are so abundant, and are so continuously being added to, that doubt can no longer exist, except in the minds of those who are prejudiced against anything which cannot be clearly seen or understood.

That a well will take in as much water as it is capable of yielding is known to those who have given any attention to the subject. The well-known law of hydraulics, which is simply expressed in the words "Water will always find its own level," operates also in this matter, and if a well is sunk on an underground stream, and the water rises in the well to any specified height which remains stationary on pumping, the continuous influx of water from the surface in quantity equal to that which could be extracted would not alter the level in the well except perhaps for a short period.

So in those cases of land which requires draining, where there is difficulty with the outlet, the diviner will often be able to discover underground streams which, when pierced with bores or wells, will effectively carry away the surplus water from the surface, and so make the land available to the agriculturist.

When these streams are located and the soil is favourable, they may be tapped with any suitable boring apparatus, such as an ordinary post-hole auger or any such improvised arrangement capable of boring through ordinary earth or clay. Should rock be met with, rock-drilling tools must be used, and the hole should be continued until the diviner is satisfied that the proper stratum has been pierced and that the stream he is after has been reached; the means of knowing this cannot be stated here, but they are known to good diviners and are infallible. When this has been accomplished, case the bore with any suitable casing about 6 in. in diameter; the usual bore casing is too expensive to use for this purpose at present, but galvanised casing may be made and used effectively, or even black iron riveted together. This should be inserted to within a few feet of the bottom of the bore, and brought up to say within 5 ft. of the surface and secured with a flange or by some other means. An excavation about 3 ft. square or round should be made to a depth of 5 ft. and slabbed or bricked in, with a concrete bottom if practicable. All the land drains over several acres can then be conducted to this point, and it will be found that, except during excessive rainfalls, all surplus water will disappear just as the rivers in the Australian interior disappear into the earth. If the underground stream is not too deep—say, about 30 to 40 ft.—a 4 ft. by 3 ft. well, slabbed in the usual way, would be better than a bore, and these can be multiplied to any extent, thus solving what is sometimes a difficult problem.

It must be distinctly understood, however, that this method is not intended to take the drainage from the house or farm buildings, as that would mean the contamination of streams which may be afterwards used for potable water supplies, but this precaution can always easily be taken, so that absolutely no danger can exist.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

No. 14.

Prickly Poppy (*Argemone mexicana*, Linn. var. *ochroleuca* (Sweet), Lindl.).

The Prickly Poppy (*Argemone mexicana* var. *ochroleuca*) has lately been gazetted a noxious weed throughout the State and numerous requests have been received, especially from shire councils, for a description and illustration of the plant. The following account should aid in its identification.

Description.—A robust, herbaceous plant of 2-4 ft. Stems prickly. Leaves glaucous (bluish green) blotched with white, edges spiny-toothed, the midrib and main veins also bearing a few prickles on both the upper and lower surface of the leaf. Flowers very pale yellow or cream coloured. Capsule prickly, opening in valves at the top, full of small, round, brown seeds with a pitted surface.

Distribution.—A native of the West Indies and tropical America; has been introduced into most warm countries and become more or less of a weed. In Queensland it is very widely spread, being found, practically speaking, throughout the whole State, except, perhaps, in a few out-of-the-way places.

Common Names.—In Queensland the plant is most commonly called "Prickly Poppy." In cooler countries, such as parts of Europe and North America, it is cultivated as an ornamental plant under the name of "Mexican Poppy." It is the "Devil's Fig" or "Fico del Inferno" of the West Indies. "Gamboge Thistle" and "Thistle Poppy" are other names applied to it.

Poisonous Properties.—Both in Australia and abroad, the plant has been accused of poisoning stock; in addition to its prickly nature, however, the plant yields a very bitter, yellow juice, and it is not likely that stock would eat the plant to any extent. The seeds are poisonous, and cases are on record in India where a number of people suffered from vomiting and purging after using sweet oil which had been adulterated with Argemone oil ("Agricultural Ledger of India," 1907, p. 37). It belongs to the Poppy family (Papaveraceae) which contains several poisonous plants.

Uses.—The "Agricultural Ledger of India" of 1907, No. 5, deals exhaustively with the uses of this plant. The seeds are oleaginous and the oil has valuable drying properties though not so valuable in this respect as linseed oil; it could be used in paint manufacture and in soapmaking. The oil has been used in India as an external application in skin diseases, it is said, with beneficial results.

Eradication.—In Queensland we only have to do with the plant as a noxious weed. As the plant is a very heavy seeder, seed production should be prevented by hoe-cutting the younger plants, either the leaf-tufts before the flowering stems are formed, or the older plants before the seed has ripened. Spraying with a weed-killing solution should also be successful where the plants are growing thickly together.

Botany.—The variety which is such a bad weed in Queensland is the variety *ochroleuca*, distinguished by its light coloured flowers and a few other characters. The typical form (var. *typica*) is sometimes, though not often seen; it has greener leaves and bright, deep yellow flowers.

PLATE 10.—PRICKLY POPPY (*Argemone mexicana* var. *ochroleuca*).

A Shoot, natural size, showing flowers and unripe capsule.
B Capsule, showing the peristent placentas (*p*) and style (*s*).
C Seed, natural size and enlarged

Entomology.

THE SUGAR-CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Dr. J. F. Illingworth, Entomologist to the Bureau:—

"Fortunately, we are, at last, experiencing ideal growing weather, and, even the weeds are coming on apace. The cane never looked better.

"BEETLE EMERGENCE.

"Really our first good rains did not come, at Meringa, until 19th December, though we had a brief downpour on the 28th of November, that brought out a few beetles.

"Both the greybacks, *Lepidiota albohirta*, and *L. frenchi*, have come out in great abundance this year; this being the time for the regular biennial occurrence for the latter species.

"The extreme abundance of *frenchi* has made it possible for us to add materially to our knowledge of the habits of this species. Since they do not remain on the feeding trees during the day, like the greybacks, there has been less opportunity to study them.

"Upon the approach of darkness, these smaller brown beetles crawl up out of the grass where they have been hiding, and, for about ten minutes, every where about you is one seething hum of the insects. The females settle first upon any low object, bushes, dry twigs, or even upon the fences, and mating at once takes place. Usually, several males cluster about one female, but as soon as one secures connection, he lets himself fall backward, so that he hangs head-downward, and the other males fly away. The pair remains in this position, perfectly motionless, for about twenty minutes, when they separate and fly to their feeding trees, where they remain until morning. Soon after daylight, about half an hour before sunrise, they again become active, leaving the trees in one concerted flight, which lasts for about five minutes, when everything becomes quiet. In place of going straight into the ground, the beetles usually settle upon the stems of any convenient plant, about 18 in. from the surface; here they remain perfectly motionless for several minutes, then proceed slowly downward, into the grass, and finally enter the soil. It is this habit that makes them an easy prey to the 'early-bird.'

"BIRDS A VALUABLE ASSET.

"Soon after the first flight of the beetles this year my attention was attracted by a flock of fowls and ibises under one of the large rubber trees in the Mulgrave Mill yard. They were all actively feeding upon beetles which were dropping out of the tree. Upon closer observation I saw that there were a number of smaller birds in the branches, and these, too, were eating the insects. Usually when one of the birds hopped on a twig and secured a beetle, several others were dislodged and fell to the ground, where they were quickly gobbled.

"I have followed up this interesting line of observation, using my 6X binoculars, with excellent results. Ordinarily, the birds are very timid, in this district, because of a lack of energetic protection; and they scatter before one can get near enough to see what they are eating. By approaching quietly, however, with the glasses, I have been able to observe most of our moderately-sized birds feeding upon the beetles. It may be interesting to note a few of these, such as, the magpie lark, yellow belly, leatherhead, butcher bird, myna, satin bower bird, black bird, laughing jackass, &c. The first two are by far the most numerous, and have the advantage that they follow their prey to the ground if they fail in their first attempt at securing it.

"Most of these birds are too small to swallow the greybacks at one mouthful, but when one is near enough, he can see that they beat the insect to pieces on the larger branches before attempting to down it. Then, too, the quantity eaten by a single bird is limited, but they make up for this in numbers. Just after daylight there is a constant stream of the birds through the feeding trees of the beetles.

"As will be noted above, even the fruit-eating birds take kindly to the beetles during this, their nesting season—a fact which agrees with my experience in America, where most of the seed-eating birds feed their young upon insect diet.

"Protection of the bird life of a country is certainly worth considering, for we cannot begin to estimate their value to man, even those that we sometimes class as enemies, when they occasionally eat our corn or kill our chickens. Undoubtedly, birds are the greatest factor in the control of insect pests.

"Theoretically, almost any minute insect with its rapid methods of multiplication, would overrun the earth, making it impossible for man, or other animals to exist, if the offspring of the insect all survived and reproduced.

"This has been forcibly illustrated by T. Bainbrigge Fletcher, in his work on 'Some South Indian Insects,' where he takes the case of an insect laying only 200 eggs and having a life cycle of one month. Starting with 1st January for convenience, a single fertilised female lays 200 eggs, all of which hatch and mature by the end of the month; on the average, half of these will be females, each of which will lay 200 eggs on 1st February, and by the end of February we have $100 \times 200 = 20,000$ mature insects, of which half again will be females laying between them $10,000 \times 200 = 2,000,000$ eggs. Continuing, simple calculation shows that by the end of the year the descendants would reach the prodigious total of two septillions (2,000,000,000,000,000,000,000,000) of individuals. The human mind is quite incapable of grasping the significance of such a figure, but a few comparisons may assist the imagination. If 1,000 of the insects weighed only 1 oz., their united weight would be 558,035,718,571,425.5 tons, and if 1,000 measured 1 cubic inch, they would cover an area of almost 50,000,000,000,000 square miles with a uniform layer 1 in. deep. Taking the dry surface of the whole earth to be 51,000,000 of square miles, they would cover the whole of this to a depth of over 81 ft.

"Figures such as these are suggestive of what may take place if an insect meets with particularly favourable conditions for development. Probably the most important of these are: (1) favourable climate, (2) abundant food, and (3) freedom from enemies.

"Nature is, usually, nicely balanced, so that no species becomes predominant. Man, however, is often the means of upsetting this balance by transferring insects to new countries, where, removed from their natural enemies, they often become serious pests; or, again, by cutting the forest, he interferes with the nesting of insectivorous birds, &c., with the result that his crops are destroyed until Nature is again able to maintain her balance.

"It is now well recognised that man is able to greatly assist Nature in regaining this equilibrium; and much has been done by the introduction of insect parasites. It is possible, however, to do just as important work by encouraging the birds through protection, &c., so that they will multiply near our homes.

"CULTIVATION EXPERIMENTS.

"I have started an extensive series of cultivation experiments, with proper checks, at the Greenhills Estate, on fields which are regularly destroyed by the grubs. These experiments cover both plant and ratoon crops, and we can hope for some very interesting results within a few months, for the cane is an excellent stand at present.

"Three types of implements are being used, harrow, planet junior, and plough; and I am also trying at different intervals to determine how often it is necessary to stir the ground and disturb the beetles.

"The cane in the Meringa plots is a perfect stand; and, though it was planted in April, it got such a setback by the drought that I am still able to keep the horse going through it. I am hoping for results of this intensive cultivation within the next two or three months.

"NOCTUID MOTH BORER, *PARASSATIPHILA TRUNCATA* WALK.

"Mr. P. H. Edington, at Deeral, has suffered considerably from this pest. The insects have continued for several months on his plant cane; and he told me that he had renewed fully 75 per cent. of the plants in the worst-affected field. At the present time the cane is almost free from attack and as high as one's head, but very uneven, due to the fact that it has been supplied at various times.

"I was not able to locate any of the parasites, though at the time of my visit it was a very difficult matter to even find a caterpillar of the moth in the infested stalks; most of the runs of the borer had been cleared out by the brown ant, *Pleidole megacephala.*"

THE ST. JOHN'S WORT PEST.

PROPOSAL TO UTILISE INSECT ENEMIES FOR ITS ERADICATION.

We have received from the Commonwealth Advisory Council of Science and Industry a report that the Council intended to introduce a beetle to feed on the St. John's Wort, a weed which has become a serious pest in Northern Victoria and threatens to become a pest also in New South Wales and South Australia, which has led to considerable controversy among entomologists and agriculturists in Australia, and strong opposition to the proposal has been expressed by the agricultural authorities in Victoria, supported by experts in South Australia and Western Australia.

The general question of the utilisation of insects as agents for the eradication of weed pests has aroused controversy previously in other parts of the world as well as in Australia, and opposition to proposals of this sort has always been based on the danger that the imported insect might become a more serious pest than the weed that it was introduced to suppress.

That the Advisory Council was fully aware of this aspect of the case is shown by the following extracts from the latest report of the Executive Committee. It is there stated "A weed which threatens to become a very serious pest in the temperate parts of Australia is the St. John's Wort. The Committee came to the conclusion that a possible solution of the problem would be the introduction of some insect which would feed only on St. John's Wort, and they have received from England, through the kindness of Professor E. B. Poulton, F.R.S., of Oxford, and Mr. J. C. F. Fryer, Entomologist to the Department of Agriculture, a list of such insects, prepared by Commander J. J. Walker, R.N. The most promising appears to be the St. John's Wort Beetle, *Chrysomela hyperici*, but further evidence is required as to the damage caused by this beetle to its host plant. According to present information, the liberation of the beetle in Australia would not involve any risk to crops, but this will, of course, require to be proved definitely by properly designed experiments.

The introduction of insects to deal with weeds has already been carried out in Australia on two occasions by the Queensland Department of Agriculture. The lantana-fly was brought from Hawaii to combat the lantana, and a cochineal insect from India to destroy a species of prickly-pear. Both these introductions were carried out under the supervision of Mr. Henry Tryon, Government Entomologist and Plant Pathologist of Queensland. As a member of the Queensland Government's Travelling Commission on Prickly Pear, Mr. Tryon visited nearly every country in the world to investigate insect enemies of prickly-pear, and at the same time devoted his attention to the general question of utilising insects in combating weed pests. His experience of this question is undoubtedly superior to that of any other entomologist in Australia, and his views on the proposal to introduce an insect to combat St. John's Wort are therefore of great value.

Mr. Tryon writes on this proposal as follows:—

"No entomologist is ignorant of the fact, with respect to insects that feed upon plant life, that of the thousands of different kinds that are known to exist, by far the larger number in each case derive their sustenance, in all stages of their active life, either from one plant-species or from plants constituting a single systematic group; and, moreover, if originally present where it or they were in evidence, perish with their failure and disappearance.

"Also that there are a smaller number (still very many, however) of kinds of insects whose dietary is yielded by more than one plant species, some kinds of insects being with respect to plants decidedly polyphagous.

"But entomologists do not know that there is any certainty, nor, indeed, any high probability, that any insect can or will so change its habits that whilst properly included in one of these categories, it will come to fall within the other.

NOTE.—This proposition is, of course, not affected by the fact that, having regard to food-plant relationship, any one kind of insect may erroneously have been allotted to the former category, when properly it should be regarded as a member of the latter.

"By way of illustration, the case of the lantana and its insect enemies may be mentioned. This weed is attacked by representatives of many species, and some of these (*e.g.*, *Orthezia insignis*) belong to the second category mentioned, *i.e.*, they attack also other plants. Whilst a second series—more numerous—are exclusively lantana feeders. Now, some years ago the Hawaiian authorities, utilising the services and advice of a competent entomologist, introduced to the Sandwich Islands eight of the exclusively lantana feeders, and with this result—they have secured to some extent the benefit they anticipated, whilst in no instance have they found any one

of these eight kinds of insects attacking a plant other than that it was known to victimise. In the case of one of these insects, again, the Hawaiian findings have been confirmed by observations in three other countries.

"An experiment of a like nature has been carried out with reference to prickly-year and its insect fauna.

"The present writer learnt of the existence of one insect enemy that exclusively fed on a single species of *Opuntia* and actually died out with the disappearance of this kind of prickly-pear that it had itself served to destroy. This, with the assistance of a scientific confrère, was rediscovered, taken to South Africa and to Queensland for coping with *Opuntia monocantha*, without impairment of its utility, or manifestation of the additional habit in attacking a second plant-species.

"The question, however, raised by the proposition of the Advisory Council of Science and Industry of the Commonwealth solely relates to insects associated with the injurious weed, 'St. John's Wort,' or species of *Hypericum*. Have we, it may be asked, any ground in the knowledge that is extant regarding them and their habits for concluding that the introduction of the Hypericum-associated insects will be fraught with ill effects?

"Now, regarding these insects occurring in Europe only, about one-third are reported as having been met with on plants other than *Hypericum*, one of the plants favoured by one species, in common with an *Hypericum*, being an economic plant, the timber tree, 'the Poplar.' Nineteen different kinds, on the other hand, may be regarded as exclusively feeders on St. John's Wort, no record being available of them having been met with except on plants included in this group.

"It would appear, however, that the Advisory Council of Science and Industry is only so far proceeding with the making of arrangements for the introduction to Victoria of the St. John's Wort Beetle (*Chrysomela hyperici*), which has been recommended by Professor E. B. Poulton, F.R.S., Oxford, and Mr. J. C. F. Fryer, Entomologist to the English Board of Agriculture, as being most likely to prove suitable for the purpose of eradicating St. John's Wort.

"Now, this beetle has been found occurring over a wide area in Europe, under many different circumstances of plant-association, and, although it has been referred to by many entomologists who have recorded observations concerning it from time to time since its identification, by Forster on the one part and Fabricius on the other, upwards of 150 years since, it has never been spoken of otherwise than as exclusively associated with St. John's Wort.

"The same remarks, so far as relates to plant relationship, may be also affirmed regarding three other species of Hypericum-loving *Chrysomela*, although Panzer has mentioned one of them, viz., *Chrysomela varians* of Fabricius also, as having been met with, too, on Mentha and Centaurea, a statement now regarded as due to erroneous identification.

"The correspondence suggests that the importation of *Chrysomela hyperici*, Forster, is likely to jeopardise the agricultural interests of Victoria. The present writer would submit that so far as the continued occurrence of the notorious weed in question affects these interests, they would be more likely to be jeopardised by refraining from introducing insects such as the one named in Professor Poulton's proposal, and whose presence and increase, if naturalised here, would be calculated to control its development, if not to actually exterminate it, and it is therefore fortunate that it has deemed fit to consult an entomologist of his eminence with the result of having elicited it."

(Sgd.) HENRY TRYON.

RECORD FOR WHEATEN CHAFF.

It is not so very long ago that wheaten hay chaff was almost an unknown commodity, and it is only of late that its true value as a feed has come to be recognised. It now ranks next to oaten chaff, and by many a mixture of oaten and wheaten chaffs is considered much better than pure oaten for both cattle and horses, provided, of course, that there is not too much whole grain in the chaff. The shortage of maize has also fostered a new industry, and trade in bruised wheat has become a regular thing, and seems to have come to stay. At a sale early in February last at the Roma-street produce markets a record for the market was put up for wheaten hay chaff, very choice lines selling at 11s. 2d. and 11s. 3d. per cwt, other lines changing hands at 10s. 9d. and 11s.

General Notes.

SOCIETIES' SHOW DATES, ETC., 1919.

NAMBOUR.—The Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society, 10th and 11th July.

GAYNDAH.—The Gayndah Pastoral, Agricultural, Industrial, and Horticultural Association, 1st, 2nd, and 3rd July.

MOUNT GRAVATT.—The Mount Gravatt Agricultural, Horticultural, and Industrial Society, 26th July.

INKERMAN.—Mr. E. F. Ryan has been appointed Secretary of the Inkerman Farmers' and Progress Association.

The title of The Caves Central Barmoyea Farmers' Progress Association has been altered to The Caves Farmers' Progress Association. Thos Ritchie, Secretary.

Answers to Correspondents.

APPLICATION OF MEATWORKS FERTILISER TO POTATOES.

In response to the inquiry made by Mr. H. R. Trueman, Mr. A. E. Gibson, Agricultural Instructor, has furnished the following information:—

"The best method of application is to broadcast the fertiliser over the ploughed land, which should then be disced deeply, and the land should be subsequently ploughed to the full depth prior to planting. By so doing more even distribution of manure is obtained and the roots are encouraged to descend and spread out.

"A system of opening drills and spreading the fertiliser along the bottom, following with a stroke of the harrows in the same direction as the furrows, prior to planting, is very often followed, but the same even distribution of fertiliser throughout the soil is not obtained.

"Meatworks manure used alone without some form of potash, such as muriate or sulphate, has a tendency to produce tops."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1919.

Article		FEBRUARY. Prices.
Bacon	lb.	1s. to 1s. 1d.
Barley	bush.	5s. to 5s. 3d.
Bran	ton	£7 5s.
Broom Millet	"	£50 to £85
Broom Millet (Sydney price)	"	£75
Butter (First Grade) 56 lb. boxes	cwt.	172s. 8d.
Butter (First Grade) 28 lb. boxes	"	175s.
Chaff, Mixed	ton	£11 to £13 10s.
Chaff, Oaten	"	£11 to £11 5s.
Chaff, Lucerne	"	£14 to £15 10s.
Chaff, Wheaten	"	£10 15s. to £12 5s.
Cheese	lb.	11d. to 1s. 4½d.
Flour	ton	£12
Hams	lb.	1s. 4½d.
Hay, Oaten	ton	£8 5s. to £9 15s.
Hay, Lucerne	"	£12 to £14
Hay, Wheaten	"	...
Honey	lb.	2d. to 5d.
Maize	bush.	7s. 5d. to 7s. 10d.
Oats	"	5s. 3d.
Onions	ton	£18 to £22
Peanuts	lb.	4d. to 6d.
Pollard	ton	£8 5s.
Potatoes	"	£20 5s. to £25
Potatoes (Sweet)	cwt.	5s. to 8s.
Pumpkins (Cattle)	ton	£15 to £24
Wheat	bush.	5s. 9d.
Eggs	doz.	1s. 6d. to 2s. 6d.
Fowls	per pair	2s. 6d. to 4s. 2d.
Ducks, English	"	4s. 6d. to 5s. 6d.
Ducks, Muscovy	"	3s. 9d. to 7s.
Geese	"	7s. to 8s. 3d.
Turkeys (Hens)	"	10s. 3d. to 12s. 6d.
Turkeys (Gobblers)	"	15s. to 22s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	6s. to 15s.
Beetroot, per dozen bundles	1s. 3d. to 1s. 6d.
Cabbages, per dozen	10s. to 16s. 6d.
Carrots, per dozen bunches	1s. to 1s. 9d.
Cucumbers, per dozen	2s. 6d. to 4s.
Lettuce, per dozen	...
Marrows, per dozen	3s. 6d. to 10s.
Parsnips, per dozen bunches	1s. 3d. to 2s.
Peas, per sugar-bag	5s. to 8s.
Sweet Potatoes, per sugar-bag	5s.
Pumpkins (table), per cwt.	12s. 6d. to 25s.
Tomatoes, per quarter-case	5s. 6d. to 13s.
Turnips, per dozen bunches	6d. to 1s.

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per case	10s. to 17s.
Bananas (Tweed River), per case	10s. to 17s.
Bananas (Fiji), per bunch	...
Bananas (G.M.), per bunch	...
Bananas (G.M.), per case	...
Cucumbers, per double case	...
Lemons (local), per bushel-case	12s. to 18s.
Mandarins, per bushel-case	...
Oranges (Navel), per case	...
Oranges (Local), per case	20s. to 22s.
Oranges (Queensland), per case	...
Pears, per case	4s. to 7s.
Passion Fruit (Queensland), per case	...
Pineapples (Queens), per case	7s. to 8s. 6d.
Pineapples (Ripleys), per case	9s. to 11s.
Pineapples (Common), per case	8s. to 10s.
Strawberries, per box	5d. to 8d.
Tomatoes, per half-case	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Eating, per bushel-case	13s. to 15s.
Apples, Cooking, per bushel-case	5s. to 9s.
Bananas (Cavendish), per dozen	2½d. to 6½d.
Bananas (Sugar), per dozen	3d. to 6d.
Cherries, per box	...
Citrons, per hundredweight	...
Cocoanuts, per sack	15s. to 25s.
Figs, per dozen boxes	7s. to 8s.
Custard Apples, per quarter-case	...
Grapes, black, per lb.	4d. to 8d.
Grapes, white, per lb.	4½d. to 6½d.
Lemons (Lisbon), per case	12s. to 14s.
Mandarins, per case	...
Mangoes (market glutted), per case for special	1s. 6d. to 4s.
Nectarines, per case	8s. to 10s.
Oranges (Navel), per case	...
Oranges (Seville), per hundredweight	...
Oranges (Other), per case	...
Papaw Apples, per quarter-case	2s. 6d. to 5s. 6d.
Passion Fruit, per quarter-case	4s. 6d. to 10s. 6d.
Peaches, per quarter-case	5s. to 9s.
Peanuts, per lb.	4d. to 6d.
Persimmons (market glutted), per quarter-case	1s. to 2s. 6d.
Pineapples (Ripley), per dozen	1s. to 3s.
Pineapples (Rough), per dozen	1s. to 3s.
Pineapples (Smooth), per dozen	1s. to 3s.
Plums, per case	4s. to 8s. 6d.
Rockmelons, per dozen	4s. to 12s.
Sugar-melons, per dozen	5s. to 15s.
Strawberries, per dozen boxes	...

TOP PRICES, ENOGGERA YARDS, JANUARY, 1919.

Animal.	JANUARY. Prices.
Bullocks	£20 12s. 6d. to £28
Cows	£15 5s. to £20 5s.
Merino Wethers	47s. 3d.
Crossbred Wethers	44s. 6d.
Merino Ewes	40s. 6d.
Crossbred Ewes	36s.
Lambs	30s.
Pigs (Bacon)	...
Pigs (Porkers)	58s.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Jan.	Average Rainfall. No. of Years' Records.	Total Rainfall. Jan., 1919.	Total Rainfall. Jan., 1918.
North Coast.	In.		In.	In.
Atherton	12·69	17	4·10	15·94
Cairns	17·26	36	8·62	13·73
Cardwell	17·14	46	8·58	25·07
Cooktown	15·16	42	9·10	8·53
Herberton	9·77	31	6·27	14·81
Ingham	16·78	26	9·20	27·25
Innisfail	21·53	37	12·54	16·48
Mossman	20·33	10	10·09	17·08
Townsville	11·69	47	6·09	27·75
Central Coast.				
Ayr	11·83	31	6·68	31·13
Bowen	9·61	47	9·70	46·57
Charters Towers ...	5·69	36	1·16	12·07
Mackay	13·83	47	10·24	85·09
Proserpine	16·09	15	13·79	58·90
St. Lawrence ...	9·08	47	1·71	49·44
South Coast.				
Biggenden	5·43	...	0·58	9·32
Bundaberg	9·20	35	0·16	1·90
Brisbane	6·42	68	0·32	7·70
Childers	7·94	23	0·21	13·89
Crohamhurst ...	13·02	25	0·43	20·20
Esk	5·51	31	2·21	7·62
Gayndah	4·79	47	0·73	9·83
Gympie	6·64	48	0·44	11·17
Glasshouse M'tains	8·65	10	0·09	16·64
Kilkivan	5·62	39	0·76	13·06
Maryborough ...	7·31	47	0·49	14·07

Divisions and Stations.	Average Rainfall. Jan.	Average Rainfall. No. of Years' Records.	Total Rainfall. Jan., 1919.	Total Rainfall. Jan., 1918.
South Coast—continued:	In.		In.	In.
Nambour	9·01	22	1·12	15·14
Nanango	4·55	36	0·18	7·79
Rockhampton ...	8·65	31	0·34	34 36
Woodford	7·13	31	0·20	15·79
Darling Downs.				
Dalby	3·29	48	0·71	5·13
Emu Vale	3·28	...	0·89	4·17
Jimbour	3·82	...	0·67	5·09
Miles	3·96	33	1·03	4·74
Stanthorpe ...	3·69	45	0·18	3·72
Toowoomba ...	5·04	46	0·48	6·15
Warwick	3·71	31	0·23	3·17
Maranoa.				
Roma	3·39	44	1·74	8·93
State Farms, &c.				
Bungeworgorai ...	1·08	...	0·49	8·76
Gatton College ...	4·32	...	1·13	7·36
Gindie	3·29	...	Nil	21·95
Hermitage ...	2·92	...	0·15	3·79
Kairi	7·29	4	4·76	18·30
Sugar Experiment Station, Mackay	14·0	...	10·29	78·17
Warren	2·08	4	0·44	34·31

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

Farm and Garden Notes for April.

Field.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high, go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

Kitchen Garden.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

Flower Garden.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·41	6·20	5·58	5·47
2	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
3	4·59	6·46	5·23	6·41	5·42	6·18	5·59	5·44
4	5·0	6·46	5·24	6·41	5·43	6·17	6·0	5·43
5	5·0	6·46	5·24	6·40	5·44	6·16	6·0	5·42
6	5·1	6·47	5·25	6·39	5·44	6·15	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·12	6·2	5·38
10	5·3	6·47	5·28	6·36	5·46	6·11	6·3	5·37
11	5·4	6·47	5·29	6·36	5·47	6·10	6·3	5·36
12	5·5	6·47	5·30	6·35	5·48	6·9	6·4	5·35
13	5·6	6·47	5·31	6·35	5·48	6·8	6·4	5·35
14	5·6	6·47	5·31	6·34	5·49	6·7	6·4	5·34
15	5·7	6·47	5·32	6·33	5·49	6·6	6·5	5·33
16	5·8	6·47	5·33	6·32	5·50	6·5	6·5	5·32
17	5·9	6·47	5·33	6·31	5·50	6·4	6·6	5·31
18	5·10	6·47	5·34	6·30	5·51	6·3	6·6	5·30
19	5·10	6·47	5·35	6·29	5·51	6·2	6·7	5·29
20	5·11	6·47	5·35	6·28	5·52	6·1	6·7	5·28
21	5·12	6·46	5·36	6·28	5·52	6·0	6·8	5·27
22	5·13	6·46	5·36	6·27	5·53	5·59	6·8	5·26
23	5·14	6·46	5·37	6·26	5·53	5·58	6·9	5·25
24	5·15	6·45	5·38	6·25	5·54	5·57	6·9	5·24
25	5·16	6·45	5·38	6·24	5·54	5·56	6·10	5·23
26	5·16	6·45	5·39	6·23	5·55	5·55	6·10	5·22
27	5·17	6·44	5·40	6·22	5·56	5·53	6·11	5·21
28	5·18	6·44	5·41	6·21	5·56	5·52	6·11	5·20
29	5·19	6·43	...	...	5·57	5·50	6·12	5·19
30	5·20	6·43	...	...	5·57	5·49	6·12	5·18
31	5·21	6·42	...	...	5·58	5·48	...	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.	
2 Jan.	●	New Moon	6	24	p.m.
9 „	☾	First Quarter	8	55	p.m.
16 „	○	Full Moon	6	45	p.m.
24 „	☽	Last Quarter	2	22	p.m.

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

1 Feb.	●	New Moon	9	7	a.m.
8 „	☾	First Quarter	4	52	a.m.
15 „	○	Full Moon	9	38	a.m.
23 „	☽	Last Quarter	11	48	a.m.

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

2 Mar.	●	New Moon	9	12	p.m.
9 „	☾	First Quarter	1	14	p.m.
17 „	○	Full Moon	1	41	a.m.
25 „	☽	Last Quarter	6	34	a.m.

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Agriculture.

THE COTTON PLANT IN SOUTHERN QUEENSLAND.

By DANIEL JONES, Adviser in Cotton Culture.

Eight weeks' travel through the driest and most fertile regions of Southern Queensland investigating the merits and behaviour under the unusually trying drought conditions hitherto experienced proves beyond cavil that in the cotton plant farmers have a staple crop not excelled by any other at present grown.

In this land of magnificent distances illustrating by this, as it does, the immense territory in which this crop can be profitably raised, it is surprising that the value of such an important industry has not been seized upon with more avidity than it has done hitherto, being as cotton is now recognised as the hardiest of all crops to withstand drought or other seasonal inclemencies.

In this article, necessarily a brief one, I will endeavour to present the case for the cotton plant in as concise a manner as I am able to do.

Perhaps I may first begin by brushing away some of the fallacies so commonly field anent the handling of the crop, as usually expressed by those not so well informed as they might be.

My inquiries chiefly relate to investigations in cotton-growing centres located between Mitchell, 372 miles inland from the coast, Warwick, 159 miles, and other localities within 50 miles of the city of Brisbane. The thriving condition of the cotton plant indicates that we have a vast region on which the foundations of a valuable industry can be well and truly laid if attention be concentrated on this subject.

COTTON DEFIES DROUGHT

better than any other plant at present grown. In no instance in my travels have I observed a cotton shrub fail to fruit this season, while every other form of vegetation was either dead or dying as a consequence of the prevailing drought.

On one farm visited, the owner was gathering a better crop of fibre than the same shrubs produced during the previous season, due to the fact that the plants were longer established. Usually, in our experience, the second year's growth furnishes a heavier yield of fibre than plant cotton does.

The perennial character of the shrub in some localities favours a larger production of cotton, inasmuch as the plant is more hardy and less affected by adverse seasonal conditions. Hence our advantage over growers in America, where the shrub must be raised as an annual, and is subject to seasonal conditions which preclude raising cotton as cheaply as is done in Queensland.

As bearing on this aspect of the industry, it is gratifying to note that this plant has ability to withstand prolonged drought even better than some forest trees. During this last month I have observed forest trees severely affected, while cotton shrubs in the neighbourhood were to be seen cropping vigorously on sound, healthy bushes.

Perennial-grown fibre usually is not quite as good in length of staple as on first-year plants, but the difference is not so great as to advise a departure from our established custom. If, however, the higher class of Sea Island is wanted, then it would be prudent to attempt the cultivation of this particular variety in this way. By doing so we would lose the value of the hardihood and more profuse production of the plant, so that it is, as yet, a moot point as to which method should be adopted in growing this type of cotton.

Sea Island fibre, if grown on the perennial system, usually gives a better yield, and is much easier picked than is the annually sown product, but the quality of the lint is inferior. Despite this being so, experience has shown that the quality of the cotton is such as to merit its cultivation, particularly as it will bear profitable crops up to six or eight years.

British authorities for this reason condemn our method of raising cotton as a perennial plant, although they always assess at a high value the samples of this fibre sent them for appraisement. Intimately related to this aspect is the fact that when, some time since, I submitted a sample of the Eureka, a perennial variety, to the Lancashire brokers, they valued the fibre at 1s. per lb., when American was worth 7d. This goes to show that though there may be a reason for discounting the value of perennial-grown fibre, it is not of such importance as to discourage tilling cotton as we do. I am now taking the twelfth crop from plants in Brisbane, and the bushes have come through the drought remarkably well, showing no signs of dwindling. I have, in a former article, dwelt on this aspect of the matter, but more recent investigations prompt me to again refer to the question, confirming, as they do, the more extended investigation, my former statements.

THE HARVESTING OF COTTON

is a subject on which there are erroneous ideas, particularly among those not familiar with the subject, who often permit an opinion to misplace a fact.

The picking of cotton by hand is, no doubt, a process entailing some personal discomfort until the picker becomes accustomed to the ordeal; nevertheless, it is a light, clean work, and one at which either the owner himself or his employee can make a good wage. I have met juveniles in the Lowood District and other places recently who have gathered from 100 to 130 lb. in a day of eight hours. As one grower I met paid 1d. per lb. for picking, it will be seen that a juvenile having this celerity can make at least from 8s. to 10s. per day. This is over the usual sum paid, ¾d. per lb. being the usual rate of pay for picking.

Assuming, however, that the owner gathers his 100 lb. of fibre per day, his earning on last season's values of 4d. per lb. of cotton in seed is 33s. 4d. for his day's toil. Each member of the family over school age employed can undertake and execute this task also.

I recently met a grower who, with his own family of three, gathered over 300 lb. of cotton a day, the then value of which was £5. By growing different varieties this earning ability can be extended, if required, to cover from five to eight months of the year. It is clear, then, that the harvesting of cotton, although perhaps a tiring task, has abundant compensations which other crops are unable to show.

Growers frequently have the opportunity of selecting in the field such types as are attractive; hence the ability of the picker is greatly enhanced by the ease with which the cotton can be taken from the pods.

It occasionally happens that the grower pays undue attention to the gathering of the fibre. Clean cotton is a desideratum, but it is not expected that growers should take such care in eliminating leaf or other débris which the cotton gin can better clean up. Old-time growers in particular have thought that the same system must be carried out to-day as in former years, when facilities were not so good for treating the fibre. Cotton picked in the afternoon on a dry day rarely requires sunning. In the morning's gathering, however, a little care is required not to pack damp fibre, but if the morning's cotton is spread for a few hours at the end of the rows, in all probability, if the day is sunny, the fibre will be in safe condition to bale for transport.

I have on occasions found growers take such pains with cotton as to discourage them in regard to future planting, a care quite uncalled for at the present time.

The Mechanical Picker

has for long years been the dream of the cotton-grower. Should such a machine as is here described materialise and prove the practical success which it promises to become, then will come the solution of the labour problem in cotton production.

The writer, in 1907, tested and patented a vacuum picking process in Melbourne, and subsequently at Roma street, Brisbane, based on the suction principle. Efforts were then made to arouse sufficient interest in the project, without avail. Since that time, the Federal Institute of Science and Industry, learning of the abortive attempt to build a machine, appointed a committee comprising Mr. Norman Bell, electrician, the late L. P. Weston, of the University, and the writer, to carry out tests along lines already tested, which promise to materialise into valuable service to the cotton-grower in Queensland in particular. Tests shows that, with tractive varieties of cotton, the fibre can be removed from the bolls with great rapidity.

Certain types of cotton growing in Queensland are exceptionally well adapted for mechanical picking by reason, not only of their tractive character, but of their habit of growth, which enables the system to be effectively employed once a machine is constructed.

In another portion of this Journal will be found illustrations taken from the "Scientific American," showing the method of dealing with the matter of harvesting cotton. This is claimed to be a success, and it is fervently hoped it will prove up to American description of its ability to handle cotton. In our local tests we have reason to expect that a modified system will suit our conditions better than the American one, and steps are to be taken to further locally test the improvement designed. It will not only simplify, but cheapen the cost of the machine, so that every grower will be able to own and operate his own plant. The American machine, said

to be a success, is on identical lines of the one tested and patented by the writer in Melbourne in the year mentioned. I shortly expect the American to further forestall the Australian by adding a further improvement to the machine, the Institute of Industry and Science having, on a recent date, made public the process. There is every reason to be grateful to anyone who will assist in promoting the construction of an effective mechanical cotton-picking machine, and we wish the folk who can do it "good luck."

The Profits of Cotton-growing

have during the past few seasons been of a very satisfactory nature. Personal investigation indicates that up to £26 worth of cotton has, in one instance, been gathered from 1 acre in the Lowood District by Mr. Litzow. This gentleman is well versed in the vocation, and has for a long series of years been intimately connected with cotton-growing. His advocacy of cotton is based on personal knowledge, and he is ever instancing his own experience as a guide to other farmers in the district to induce them to engage in the cotton industry. Mr. Litzow showed me a plot slightly less than an acre in extent, from which in the 1917 and 1918 seasons he has gathered £50 worth of fibre. The cotton was of the Upland variety, and had but the usual tillage. In the last year it suffered somewhat from drought, but had ever so small a rainfall happened, the crop would have been larger. As it was, over 1,700 lb. of seed cotton were obtained from 1 acre.

In the Marania district, right amongst the prickly-pear belt, one grower obtained an average of £20 worth of cotton from an area of 5 acres. Another grower on the Condamine, not far from Miles, got the same sum per acre from a block of 3 acres, and the owner writes that, but for the dry weather and an attack of insect pests, the yield would have been much greater.

So far as my investigations enable me to judge, no grower this past season has failed to get reasonable returns from the cotton plot. I have seen places where the fibre remained unpicked, when any smart adult or juvenile could easily gather from 2s. 6d. to 4s. worth of cotton per hour. Nevertheless, a lot was wasted for want of either time or disposition to win the money.

The Lacking Factor in Cotton Production

is simply that there are no persons to do it. The drift into the cities is largely responsible for this condition of things. In addition, several of our rural occupations have not been chosen with due regard to their suitability to our climatic and seasonal conditions; hence many farmers are sadly disappointed with the results of their farm operations. Not so with cotton. In many instances we have trusted to crops more adapted to temperate climates than to a subtropical or tropical environment.

This is singularly true of the cotton plant, which is subtropical in its character, while wheat and most grain crops are the reverse. Our Queensland farmers might well revise their rural methods and more closely investigate in what way a new departure will benefit the whole class.

The field operations required to successfully raise cotton are of the simplest nature, and will meet the requirements of either the inexperienced in farming or those with only a little capital to expend. Hence the probabilities of new settlers making good with this crop are much more favourable than with others which need more experience and capital to profitably produce.

A large influx of settlers into the rural centres known to be adapted to the cotton plant would at once meet the conditions wanted to increase the crop, if only to the dimensions reached a half century since, and would be of inestimable service to the country.

No Vocation will Assist Soldiers' Widows

to maintain their families in such comfort and independence as can be achieved by assisting the widow to settle on, say, a 5-acre block with a comfortable dwelling provided.

A few hundred families resident in a cotton-growing centre would provide, from the juvenile element in the family, much of the help required by the farmer at picking time. As this work would be well paid for and be constant for several months of the year, the home treasury could be well filled with cash for household needs. In addition, the family could maintain themselves cheaply by having a small farm residence on which to raise poultry, vegetables, or, if necessary, a few acres of cotton or castor bean, products which are easy to raise on small lots and will bring in a substantial increase to the widow's pension.

If our land settlement authorities take up this question in this manner, problems of land settlement and labour drift to the cities would to some extent be solved and rural pursuits materially advantaged by an influx of new folk, to whom the new life would prove immeasurably better than the artificial existence of the great cities.

Homesteads for the Returned Soldiers

could be furnished by the thousand in these districts from either large holdings by purchase or by the subdivision of smaller areas that would meet every demand from this direction. Thousands of acres which now return a gross production of only a few pounds' value per acre could by an easy process of assisted land settlement be made 50 per cent. more remunerative than at the present, utilised as they are in growing low-value crops. Compared with that possible to produce from a cotton field, the crops now popular with the farmer do not in any way represent the latent value of the soil. Only by this new departure in rural activities will the settler do full justice to himself, his family, and his country.

Celerity in Picking Cotton

depends largely on the facilities offered in the field. Too many growers are timid in putting under crop an ordinary sized plot, but confine themselves to a few acres, fearing inability to gather.

It is quite patent to anyone familiar with this vocation that if only, say, 5 acres are under crop, and if two or three of the farmer's family start to pick, the amount of fibre remaining after a couple of days' work will be a minus quantity. This precludes a good day's gathering, and instead of 100 lb. or over being picked, the shrinkage amounts to half what ought to be picked. Failure to gather the ordinary estimated amount is frequently due to an insufficient area to operate upon.

Granting that in a good flush of fibre a juvenile's capacity for picking is 100 lb. daily, and assuming an average yield per acre to be 1,000 lb. of cotton, this should be but a ten days' task for one picker. To put into the field more than one hand to 10 acres at the commencement of the harvesting season is thus likely to nullify the ability of the picker by reason of absence of a sufficiently large crop, which has to be divided among several pickers instead of allowing one hand to have the whole field to himself.

Assuming that it is possible to gather fibre on 100 days in the season, which is quite within the range of practicability, it follows that one person gifted with celerity of an ordinary nature could control at least 10 acres in the season. As the picking season in Queensland can be made to extend for at least seven months in the year, it will be seen that the task set down as practical for a picker can even be exceeded, based on the idea of ability to gather the quantity assumed per day.

As the outside cost of raising an acre of cotton from seed time to the harvest period should not exceed 40s. an acre—in many localities less than this. Seed being delivered free by the Department, restricted cultivation can hardly be excused under the circumstances.

COTTON SEED IMPORTS.

The Federal Government has issued a proclamation prohibiting the importation of cotton seeds to Australia from any part of the world excepting under permit.

In connection with this proclamation, we in Queensland welcome it as a step which should have been taken long ago. Fortunately, no evil results followed the importation of cotton seed to Queensland in the early day of cotton-growing in our State, if we except the appearance of the cotton boll worm, if, indeed, that pest came with the first importation of cotton seed in the sixties, which is more than doubtful, seeing that the worm was found in maize cobs before cotton was dreamt of in the then colony. The Queensland Department of Agriculture has always exercised the utmost vigilance to prevent the introduction of undesirable plant pests, with the result that the formidable boll weevil, which devastates thousands of acres in the cotton-growing States of America, and has cost the United States Government some £15,000,000 in attempts to eradicate it, is unknown in Queensland, and the same may be said of the leaf-eating cotton worm, the American red cotton-stainer, and various fungoid pests common in older cotton-growing countries.

The necessity for extreme caution in importing cotton seed cannot be too strongly emphasised, and this is clearly shown in an article in the Year Book of the Department of Agriculture of Madras, India, 1918. The writer is the Acting Government Entomologist, Mr. T. V. Ramakrishna Ayyar, B.A., &c., the subject, "Some Notes on the habits and Life History of the Stem Weevil attacking Cambodia Cotton." "This weevil," he says, "is a very small creature about an eighth of an inch in length, resembling more or less the stored rice weevil. Curiously enough, it has been noted in Behar, in Northern India, and in South India it appears to be confined to the Coimbatore district. There is not yet sufficient ground to state with any amount of authority that the insect is one of the many introduced forms in India. But that it should be found in widely distant areas such as the two above-mentioned, without being found anywhere between these two, shows something surprising regarding its distribution and occurrence. If it exists in some tracts, there is no reason why it should not appear on cotton in other tracts, as this creature does not confine its attacks solely to Cambodia cotton, but also to local varieties, as is found on the Coimbatore farm."

The writer explains that the mischief is not done by the adult weevil, but by the young one, called the "grub," which bores through the stem tissue of the plants, and affects them very seriously. When young plants are attacked, they are in most cases killed, as the slender stem is unable to stand the attack. In the case of those which are grown up (say four or five months old), though the stem is affected, although many dry up, several plants withstand the attacks. In bad cases the loss might be put down at from 15 to 20 per cent. of the usual out-turn. The prevention methods, of whatever nature, have to be directed to the prevention of the weevil laying eggs on healthy plants. With this idea in view, the following methods were tried:—

(*a*) When the pest was apprehended, young plants were smeared at the stem just above the ground with dilute phenyl.

(*b*) The stem at the ground level was earthed up with a mixture of loose soil and lead arsenate powder.

(*c*) The plucking and burning of badly infested plants.

The first two methods produced no results worth recording, as the plants so treated became infested as usual. The prevention method of pulling out and destroying the first attacked plants considerably checked the ravages of the pest. But this, of course, has to be resorted to by all cultivators in one tract, else the benefit will be unappreciable.

The entomologist believes that if there is a lull of at least two months between one cotton season and the next, when there will be no cotton plants at all in a tract, the pest may be starved out and some reduction in its numbers effected.

This pest has, thanks to stringent regulations, and to the fact that no Indian cotton seed has been imported by the Queensland Department of Agriculture, never made its appearance in our State, and all the seed obtained from the United States and from Egypt has been absolutely sterilised at the shipping ports, and again on arrival. All seed supplied to our farmers is, therefore, free from either insect or fungoid pests.

BEEKEEPING MAY INCREASE THE COTTON CROP.

Fertilisation of the Cotton Flower takes place soon after Sunrise—Twenty five to Fifty Pollen Grains necessary for each Flower—Shedding of Bolls often due to Imperfect Fertilisation.

Rowland M. Meade, Bard, Cal.*

The percentage of cotton flowers that develop into mature bolls is generally low. Even under the most favourable conditions many of the buds do not reach the blooming stage, and many flowers that open fail to set bolls.

A test of twelve Upland varieties made at Bard, Cal., in 1911, showed that during the first thirty days of flowering, 44 to 66 per cent. of the flower buds aborted before opening, and that 22 to 52 per cent. of the flowers that opened failed to develop into bolls. An examination of all the nodes on the fruiting branches at which it would have been possible for bolls to develop showed that at only 12 to 23 per cent. of these nodes were bolls produced.

In the same series of varieties at San Antonio, Tex., in 1912, 35 to 82 per cent. of the flowers that opened failed to mature bolls. The shedding at San Antonio was doubtless due largely to unfavourable climatic conditions, as drought, and, also, to the depredations of the boll weevil. The boll weevil, however, is not present at Bard, and as irrigation is practised the lack of water could hardly be an important factor. Inadequate pollination was considered as a possible cause of the shedding, when the flowering stage had been reached.

The cotton flower is a large, cup-shaped blossom; it is borne in an upright position on the upper side of the fruiting branch. The structure and relation of floral parts are shown in Fig. 16. The pollen grains are very large and have moist spinose surfaces, so that they tend to cohere when freed from the anthers and are not carried about by the wind.

PERIOD OF FERTILISATION SHORT.

The period during which fertilisation is possible lasts only a few hours. The flowers open soon after sunrise, commence to wither as the temperature rises in the middle of the day, and close in the evening, when the stigmas are dry. The second or third day after blooming the petals, stamens, and pistil separate from the rest of the flower and fall from the plant.

In some types the relative position of the stigmas and stamens is favourable, and in others unfavourable, for self-pollination. This doubtless partially accounts for the differences between varieties with respect to the percentage of flowers that develop into bolls.

LONG STAPLE COTTON OFTEN SELF-STERILE.

Most of the flowers with long stigmas projecting above the stamens do not become completely self-fertilised, as the anthers and stigmas are too widely separated. The flowers of many of the long staple varieties are of this type, the stigmas often exceeding the anthers by 15 mm. (See Fig. 1.) The bolls resulting from such flowers have 23 to 50 per cent. of aborted seeds, and it seems not unreasonable to attribute this abortion in part to the lack of perfect pollination. Flowers with short stigmas embedded among the upper stamens are readily self-fertilised. Such an arrangement is shown in Fig. 2. Erect stamens, either long or short, are also favourable to self-fertilisation, since they bring the anthers in close proximity to the pistils.

Cotton bolls have three to five locks or compartments, each containing six to eleven ovules, the number varying with the type of cotton. Few locks of long staple types contain more than nine seeds, while most of those of big-bolled, short, staple types have at least eight seeds, but mature bolls in which all of the seeds are fertile are rare. In the bolls of Upland varieties 10 per cent. to 25 per cent. of the ovules fail to develop into seeds. There is usually a slightly higher percentage of aborted seeds in the bolls of the long staple types.

* This report was found among the papers of the late Rowland M. Meade in essentially the same form as presented.—J. H. Kempton.

LARGE AMOUNT OF POLLEN NEEDED.

It was found by preliminary investigation that the bolls failed to set unless at least 25 grains of pollen were applied to the stigmas; even with this number only one or two seeds matured in each lock. As each lock contains from six to eleven ovules, it is necessary for at least 25 to 55 grains of pollen to reach the stigmas in order that all the ovules of a four or five-locked boll be fertilised.

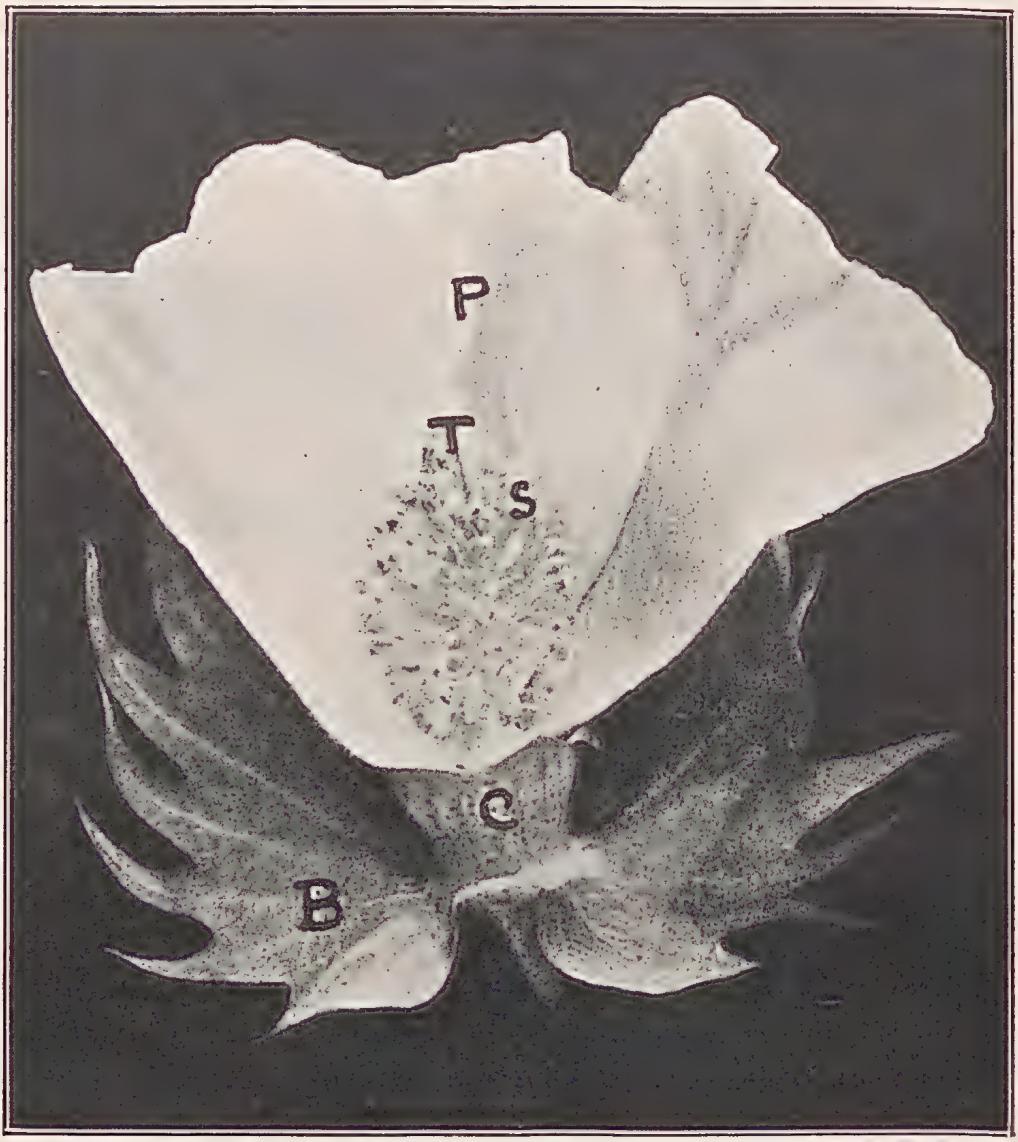

PLATE 11 (FIG. 1).—AN UPLAND COTTON FLOWER.

A dissected flower enlarged two diameters to show construction. *B*, bracts; *C*, calyx; *S*, stamens; and *P*, petals. *T*, stigma protruding above the stamens. Insects can easily visit the stamens and collect pollen without ever touching the pistil, which projects above the stamens. (Fig. 1.)

An experiment was conducted at San Antonio, Tex., during 1913, to determine whether an increase in boll production might be expected as the result of complete pollination. Two varieties of cotton were chosen for this investigation—Durango, a long, staple type with stigmas exserted beyond the stamens, and Acala, a short, staple type with short stigmas embedded among the stamens. The separation of the anthers from the stigmas in the Durango flowers reduces the chance of self-fertilisation, while the conditions found in Acala cotton favour self-fertilisation. Two rows of each variety were planted for this experiment.

EXPERIMENT EXPLAINS DIFFERENCE.

One of the rows of each variety was designated as *A*, and the other as *B*. The flowers in the *A* rows were completely self-pollinated, anthers being removed by hand, and the pollen scattered over the pistil until the stigmas were well covered. The flowers in the *B* rows were allowed to become pollinated naturally.

A small string tag with the date of opening of the blossom was securely fastened about the branch at the base of the flower to mark the position of each flower that failed to develop into a boll. The hand pollination in the *A* rows produced the effect that might be expected from the work of bees or other pollinating insects operating in great numbers, except that the manipulation of the stigmas may have been slightly injurious. There were no indications of this, however, and, as far as possible, normal conditions were provided.

Plate 12 (Fig. 2).—Cotton Flower Types.

Section of an Upland X Egyptian cotton flower on left, showing long exserted pistil. Flowers of this type are seldom completely self-fertilised. Section of a short stapled Upland cotton flower on right, with short pistil imbedded among the stamens. Flowers of this type are usually self-fertilised. Enlarged two diameters to show detail. (Fig. 2.)

The experiment was carried on during the early part of the season, when conditions were favourable for growth, and were discontinued after 10th July, because of extreme drought and the presence of boll weevils.

At the end of the season a complete record was taken of the matured bolls and of the vacant nodes bearing tags. It was thus possible, each day's record having been kept separately, to determine the percentage of flowers of each day that developed into mature fruit.

ARTIFICIAL POLLINATION BETTER.

As was anticipated, better results (an increase of nearly 11 per cent.) were obtained by artificial pollination in the Durango cotton than in the Acala variety, in which the increase was only about half as great. As before stated, the flowers of the former have exserted pistils, not adapted for perfect self-pollination, while those of the latter variety have short pistils.

The lowest percentages of bolls produced were found in the open pollinated rows of both varieties, whilst the highest percentages were found in the hand pollinated rows. In the open pollinated row of Durango, the lowest and highest percentages of bolls produced were 11 and 69.6, respectively; in the hand pollinated row, 32 and 81, respectively. In the open pollinated Acala row the lowest and highest percentages were 23 and 59, respectively; in the hand pollinated row, 34.8 and 65.5, respectively.

No effort was made to exclude insects, and the weather conditions during the course of the investigation were not unfavourable to their activities. It is evident from the increased yield of bolls secured in the long-pistiled Durango variety through artificial pollination that the presence of additional pollinating insects would aid in reducing the high percentage of shedding. The value of honey bees in this connection is recognised in some localities, and it would seem that growers of long-stapled varieties might find beekeeping a distinct advantage to the cotton crop.—"The Journal of Heredity."

NOTICE TO COTTON PLANTERS.

The Department of Agriculture and Stock is prepared to receive Raw Cotton, gin and market it on owners' account. An advance of 2d. per lb. for the year 1919 will be made upon the raw cotton received, and any surplus after sale will be paid to the growers *pro ratâ*, after deducting charges. Consignments are to be forwarded addressed to the Department of Agriculture, Brisbane, who should be advised of the despatch.

Suppliers at the close of the 1918 season received 4d. per lb. for their cotton inclusive of the advance of 2d. per lb.

COTTON ON THE CONDAMINE.

The photograph here reproduced was taken on Mr. W. E. Knight's farm "Valverde," Condamine, near Miles. Mr. Knight believes firmly in the value of cotton as a farm crop, and but for the severe drought, he would have had half as much again from the area, as, after a shower in March, the field showed a mass of blossoms and set bolls. Under the adverse conditions, his crop from 3 acres realised £60.

PLATE 13.—A COTTON FIELD ON THE CONDAMINE.

COTTON-PICKING MACHINE.

The "Melbourne Leader" of 11th January, 1919, describes a cotton-picking machine, which is reported as being highly successful in America. This machine is identical in principle with patent designs taken out by Mr. Daniel Jones, Instructor in Cotton Cultivation, of the Queensland Department of Agriculture, in Melbourne in 1906. Mr. Jones anticipates that subsequent improvements tested in Brisbane indicate that a simpler and less costly apparatus can be utilised.

Cotton-growers all over the world have had to be content with the labour of hand pickers, whose daily average amounts to about 100 lb. of seed-cotton, expert pickers being able to pick 200 lb. or even more on a heavy crop. A full description of the machine appeared as follows in the "Scientific American," 19th October, 1918:—

A SUCCESSFUL COTTON-PICKER.

By Edward C. Crossman.

Down in the Imperial Valley, California, where the mercury pirouettes gracefully between the 100 and 120 mark during the summer, and where the only drawback to raising cotton is the inability to get the garnerers thereof in the hot months, there

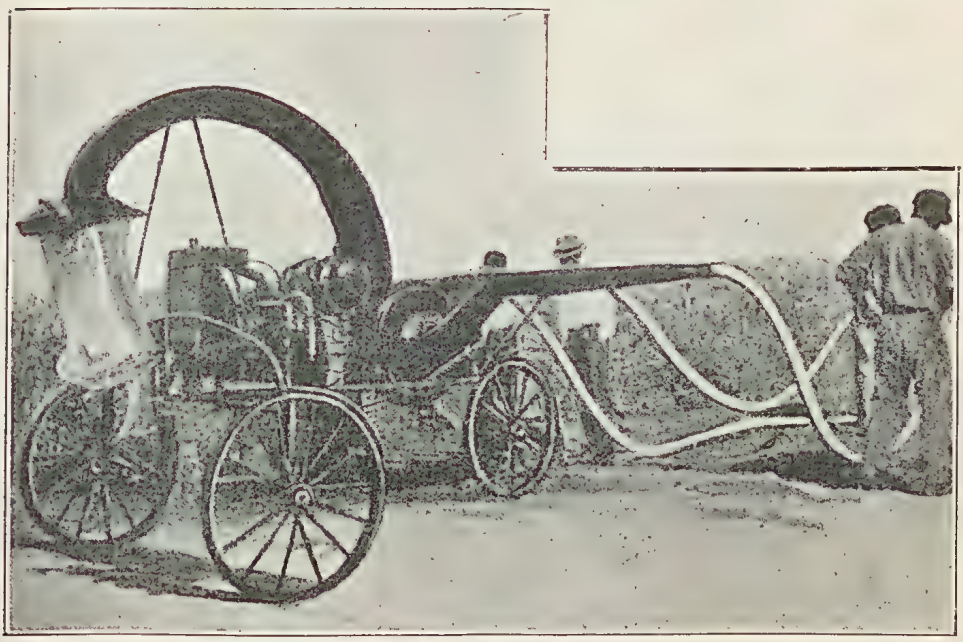

Plate 14 (Fig. 1).

is working a cotton-picking machine which, with the hard cash of the harvester "trust" considerably invested in it, must rank at least beyond the wild-eyed, blue-print stage.

To date the machine has produced cotton cleaner than that hand picked, and to date it has beaten three and four to one the pickers working by hand process as contrasted with the inexperienced men handling the picking nozzles. All of this was with the mercury around the 115-in-the-shade mark, when both pickers and crew of machine were more concerned in keeping from catching fire than in making cotton-picking records.

The largest and most experienced cotton broker in California has pronounced it practical and a success, and was the means of getting the harvester aggregation to turn its cold and fishy optics in the direction of the machine, and to untie the many knots in its purse strings to build the present and second model.

The machine weighs but 1,000 lb., and so is easily moved around from place to place. Draped artistically around its light skeleton are the 300-lb. 16-horse power engine, the suction pump for the nozzles, and the centrifugal separator for parting the cotton from the leaves, sticks and what-not, taken in by the open-minded picking nozzles.

An 8-ft. pipe runs transversely over the machine, and from this extend the light, 18-ft. rubber pipes with their patent nozzles, five of them in all.

The powerful suction pump on the machine endeavours constantly to keep the picking pipes in a state of vacuum, wherefore, when the nozzle is passed over a row of bolls, the suction picks up the cotton and carries it through the pipe and to the centrifugal separator. Here a powerful fan with hollow vanes, a departure in fan construction, separated the cotton from the leaves, the sticks, and the "motes,"

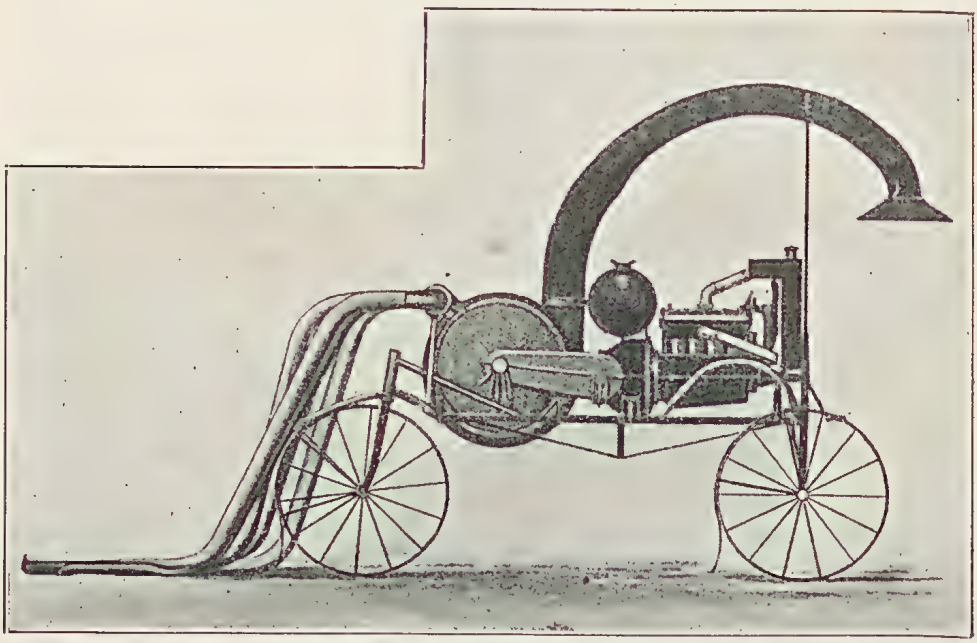

PLATE 15 (FIG. 2).

which are not desirable, and finally drives the separated mass through a curved pipe at the rear. The leaves and motes are driven out through perforations in the top of the pipe; the cotton is driven through to the sack or basket at the end.

Each one of the five picking nozzles and rubber pipes is handled by a man, and the speed of action depends on the skill he acquires. A single sweep of the patent nozzle across a row of the white blossoms is alleged to pick them clean, the time being about that required to pick one boll.

The rate of picking cotton by hand seems to vary from 100 to 200 lb. per day—the record being made by a coloured person, who picked 900 lb. in a day, but did it on the run and without attempting to do more than to get the easiest reached. Also, cotton-pickers are wasteful, the waste running as high as 50 per cent. of the crop, and the amount, according to the Government reports, running into hundreds of millions. It is human nature to pick the bolls on the top, and to let those lying in

the back-breaking strata at the bottom of the bush remain to sleep in the southern sunshine.

The persons running the California machine, described and illustrated, claim that five men with the machine can pick 1,000 lb. per man per day of ten hours, or 5,000 lb. per day, and that it does a clean job instead of a wasteful one, because the nozzles do not mind being required to get down into the bottom of the plant.

There remain plenty of woodpiles for the Ethiopian to hide in, and it may be that the machine without brains, even though directed by human hands at the very nozzles, will still not pick with the proper discrimination, but the fact remains that this is the first one on record to reach even the present stage of hopefulness.

As cotton authorities allege that last year not far from a million persons were engaged in the harvesting of cotton, the machine able to do the work of five times the number of men needed to operate it, and to do it with little labour on the part of the crew, might well be an invention of serious national need.

Plate 16 (Fig. 3).

ONIONS AND ONION-GROWING.

As the time approaches for preparing for an onion crop, it will not be out of place to give directions for sowing the seed and for the after cultivation of this most valuable vegetable. There is no reason why onions should be imported in such quantities as we see daily arriving by steamer from the Southern States. The climate here is perfectly adapted to them, and, if only planted on suitable soil and given the necessary attention, heavy crops are an almost certain result. At one time it used to be said that onions could not be profitably grown as a field crop in the Blenheim district, near Laidley. To disprove this, the writer determined to experiment on the sandy loam of the scrub land on Sandy Creek. The seed was sown in April; the variety, Brown Spanish. The land to which they were to be transplanted was well worked and then rolled to make a hard, compact bed. Transplanting as carried on throughout July, and the season having proved favourable the result was a heavy crop of magnificent bulbs, which gave a splendid return for the labour

expended. Now, if such a result can be obtained by one farmer, it follows that others can do the same. As there are thousands of acres of similar land under cultivation both there and in many other portions of the State, it only requires determination on the part of the farmers to enable them to successfully displace the importations from the South.

On looking over an old diary of farm operations, it appears that the writer's crops averaged 6 tons per acre, and sold at £25 per ton. Are there many crops which will give a like return? The present price of onions in the market is about £24 per ton. Now, suppose a crop to yield 8 tons per acre (and we know that double that return has been made), the cash return for a medium crop will amount to £192. Certainly there is a considerable amount of labour involved in planting out an acre or two of onions, but that labour is amply compensated for by the net returns.

A consideration of the following notes, based on practical experience, may, therefore, be of some service. Let us first consider

THE SOIL.

The most suitable soil for onions is a rich sandy loam, such as that of the Blenheim scrubs—free, friable, and easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In such a case the land should be well drained. An eastern or south-eastern aspect has been proved to be better than if the land sloped to the west, as the onion does not require intense heat to bring it to perfection.

Before sowing the seed, it is important that the seed beds should be clear of weeds and of their fallen seeds. By sowing in April or May, there is not much to fear from weeds; still, it is advisable that the land, both of the seedbeds and of the area proposed to be planted out, should be turned up and exposed to the weather for some time previous to sowing. As soon as the weeds appear, give the land a good scuffling, and if this be done two or three times between March and April there will be no trouble afterwards. If the soil be not virgin scrub, or if it has borne crops for many years in succession without manuring, it should be thoroughly well manured with stable dung, ashes, bonedust, &c., as the onion demands plenty and the best of nourishment. New scrub land is rich enough in natural fertilisers not to require any addition of manure.

PREPARING THE SOIL.

In planting out onions a very serious mistake is often made, and that is, the soil is carefully worked, reduced to a fine tilth, and the plants are set out in a soil which is loosened to a depth of perhaps 8 inches. From land prepared in this manner no good results need be expected. The onion requires a firm bed; otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and have more the appearance of a leek than of an onion. Therefore, the land before being planted must be well solidified by rolling.

THE SEEDBED.

Onions may be sown broadcast, or they may be drilled in, or they may be sown in a seedbed and afterwards planted out in the same manner as cabbages. The best way is to drill them in. In this case, about 2 lb. of seed per acre will be required. The seeds must be dropped at a distance of about 2 inches apart in the drill, and the drills should be from 12 inches to 15 inches distant from each other. The plants will afterwards require thinning out with the hoe. When sown in a seedbed, planting out must be resorted to—a tedious process, but one that pays well for doing well.

On rich soil the plants may be 6 inches apart. The drills should be slightly raised, and the roots of the plant firmly embedded in it—allow the bulb to, as it were, squat on, not under the surface. As the plant grows, the soil must be kept perfectly clear of weeds, and, where the working of the ground has thrown the soil against the bulbs, it must be drawn down, so that only the root is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb formation is to wring the necks of the plants, or, at least, to bend them down with a twist. This will have the effect of inducing the formation of bulbs.

When sowing the seed, care should be taken that they are not covered to more than their own depth. If sown deep, many seeds fail to germinate, and most of those that do appear will make an abnormal growth of neck, causing much labour in drawing away the soil from the incipient bulbs. The writer has never sown onions broadcast, and therefore offers no opinion on the value of the method. Of course more seed would be required per acre, and, if weeds are troublesome, a good deal of hand work would be necessary.

Now, about the seed. There are few seeds so annoyingly deceptive as onion seed. So difficult was it to get good seed in the State even at 10s. per lb. in the good old days, that growers imported it from Spain. The largest growers at Oxley, Messrs. Martindale and Nosworthy, were most successful with imported seed, but the writer had a very bad experience in this business. Twenty pounds weight of onion seed was sent from a friend in Germany. Instead of packing it in hermetically sealed bottles, he stowed it in calico bags in the body of an immense wooden Swiss cuckoo clock. When the clock was opened the bags of seed were examined and looked perfect in colour and shape; but, alas! When subjected to pressure, no oily fatness was perceived; and when at last it was given a chance and sown thickly in drills, five acres returned the magnificent yield of 72 lb., which, at the rate of £28 per ton, amounted to 18s. Certainly, the land, after a week's waiting for the seed to germinate, was utilised otherwise, but not 1 cwt. of onions was harvested.

Make sure, therefore, of the seed. After sowing, it should germinate in less than a week.

In former days large onions were always aimed at, but now the public taste is in favour of medium-sized bulbs, so that closer planting may be adopted.

Onions may be known to be ripe by the drying up of the tops. As soon as this happens, take them up by hand and leave them on the ground between the rows to dry. As soon as they are dry, carry them carefully with as little bruising as possible to the barn.

As before stated, the Brown Spanish has proved most successful in this State, but the gentlemen above mentioned grew what they called the large White Portugal onion. It certainly was a splendid bulb, and fetched very high prices in the markets of Brisbane, Maryborough, and Rockhampton.

PULVERISED LIME IN AGRICULTURE.

So long ago as 1895, a thoroughly well equipped experimental station was established on Lord Rosebery's Scottish estates at Dalmeny Park. There it was that experiments were continuously carried out, with a view to ascertaining the value of lime to the agriculturist, and in order to enable a small dressing to be equally distributed over the soil, the lime was mechanically ground to a fine state of division. The results of the experiments were highly satisfactory. When they were commenced ground lime for agricultural purposes had never been heard of, whereas, ever since, there has been an ever-increasing demand for this substance.

Of late there were so many representations made to the Minister for Agriculture by farmers, orchardists, and others on the land, that they were unable to procure supplies of this most important material for the agriculturist at prices which would enable them to use it extensively on their lands, that the Department of Agriculture obtained a lime pulveriser, and established it at Gore, as the most suitable locality for the distribution of lime to the orchardists of the surrounding districts. The price was fixed at a low rate per ton, and the conditions were duly advertised in the "Queensland Agricultural Journal." The enterprise of the Department has not hitherto met with the success which was anticipated, few orders having been received even from those who persistently urged for the assistance which the sympathetic Minister now afforded them. The result of this disappointment has been that unless orders should greatly increase by the end of this month, the plant at Gore will be closed down, and will not be installed again anywhere, until orders for large quantities are received.

MARKET GARDENING.

RHUBARB-GROWING FROM SEED.

By THOS. JOHNSON, Frenchman's Creek, Rockhampton.

Rhubarb (*Rheum Salisum*) can be grown in Central Queensland as easily as in the more temperate parts of Australia. I have grown it in the Rockhampton district for years, and this little paper is to give to the public the result of my experience in connection with its cultivation. In the first place, the would-be grower must bear in mind that here rhubarb, like almost every other vegetable, must be treated as an annual and grown from seed.

I use the word vegetable, because, botanically, it cannot be said to be a fruit or to produce a fruit, although it is never used except as a fruit and in medicines. It can be grown on almost any kind of soil which has a good natural drainage; shallow soils with clay subsoil are liable to become waterlogged in wet weather, and are unsuitable. I have grown it on rich scrub soils with excellent results, and last year I had even better results from its cultivation on the stony alluvial deposits at the foot of the Berserker Ranges near Rockhampton, and this in face of the fact that there was no rainfall of any value during the last eight months of last year; consequently, the crop had to be grown from the seedbed to maturity, and through the growing period absolutely by irrigation. I grew by this means about 900 (nine hundred) bundles from 1½ square chains of land.

Now, a word as to the best variety to grow in this district. The old giant, and other large coarse varieties, I have discarded; they are slow in coming to maturity, the stalks are inclined to be stringy, and the colour, when cooked, is of a sickly pinkish green hue, not at all appreciated by the housewife.

The variety known as Topp's Crimson Winter proved excellent as regards colour and texture, but the stalks were rather small for marketing purposes. The variety I have found most suitable for hot, dry districts, is known as "Sydney Crimson Winter;" it is a compromise between the giant and the small variety, of medium size in length and thickness of stalk, a bright crimson colour when cooked, free from stringiness and of excellent flavour, and when to this can be added that it is a hardy and vigorous grower, it will be seen at once that it cannot be excelled as a good all-round variety for tropical Queensland.

March is the best time to sow the seed. Let the seedbeds be similar to those you would make up for raising cabbage plants, and remember that rhubarb is as gross a feeder as the brassica tribe, and requires very liberal treatment in the matter of manure—the richer the land the heavier the crop. The seedbeds should be raised 6 or 8 in. above the surrounding land so as to secure perfect drainage, as the young plants are very liable to damp off in wet weather; when about 6 in. high, and having three or four sturdy leaves each, transfer to the permanent beds, in showery weather if possible, but should it be hot and dry, and the plants in danger of becoming drawn in the seedbed, proceed at once to make lines 2 ft. apart each way on your permanent beds, fill these with water, and while still wet transfer the plants to them, pressing down very lightly, water again, and cover entirely with a large handful of mulch, and leave them so for four days, when they must be uncovered. In doing this, do not remove the mulch, but just make a hole in the middle of it large enough for the leaves to come through.

Now cover the whole of your bed with a manure mulch if possible; but, failing that, any old half-rotten leaves or grass will do; then thoroughly soak the whole bed with water.

The only after treatment is thorough watering when required, and a good crop should be assured. Rhubarb beds, laid down as above, should continue to yield good stalks for four or five months, or well into the hot weather of November or December.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1919.

The conditions for the month have been severe. Hot sultry days and dust storms were very prevalent. A number of birds are now moulting, but not so many as might have been expected under the trying conditions. A big percentage have that pale livery appearance which would be rectified by green feed, but this is unprocurable. Although the laying generally has been poor, there were several noteworthy performances registered, viz.:—Range P. Farm's A bird with 27 eggs to her credit in 28 days; L. G. Innes's C with 26; A. E. Walter's F with 25; D. Fulton's A with 25. The weekly scores for Mrs. Anderson's pen, which headed the list for the month, were 33, 33, 31, 21. This is very satisfactory, and the more so because the birds were removed at a time when there was a chance of a severe check followed by a premature moult. Three deaths occurred amongst the competing birds, and Mr. Macrae's two reserve birds died also. The causes of deaths among the birds competing will be dealt with fully in the final report. The two reserves were killed by a sheet of iron in a whirlwind during a thunderstorm. The same whirlwind took a bird belonging to the College 40 feet in the air without causing it any harm, although others were killed. The competition birds which died were T. Taylor's A bird, Oakland P. F., and D. Fulton's B. The lastnamed has been replaced. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns ...	102	1,475
*G. W. Hindes	Do.	110	1,407
*E. Chester	Do.	96	1,373
*T. Fanning	Do.	107	1,347
*W. Becker	Do.	79	1,292
*C. P. Buchanan	Do.	85	1,283
*Mrs. L. Henderson	Do.	79	1,270
*W. Lyell	Do.	93	1,268
*Geo. Prince	Do.	76	1,265
*Geo. Howard	Do.	90	1,254
*G. H. Turner	Do.	65	1,249
*Dr. E. C. Jennings	Do.	103	1,237

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
LIGHT BREEDS—*continued.*			
*E. A. Smith	White Leghorns	84	1,255
*L. G. Innes	Do.	85	1,221
*Oakland Poultry Farm	Do.	63	1,196
*C. Knoblauch	Do.	72	1,193
*R. Holmes	Do.	70	1,187
*Range Poultry Farm	Do.	96	1,187
*Quinn's Post Poultry Farm	Do.	80	1,173
*Thos. Taylor	Do.	82	1,163
*O.K. Poultry Yards	Do.	60	1,142
Mrs. L. F. Anderson	Do.	118	1,140
*Mrs. A. T. Coomber	Do.	76	1,131
B. Caswell	Do.	47	1,126
*J. M. Manson	Do.	66	1,118
J. J. Davies	Do.	40	1,117
Harold Fraser	Do.	82	1,110
*Homalayan Poultry Farm	Do.	75	1,107
*Mrs. R. Hunter	Do.	97	1,098
Geo. Trapp	Do.	103	1,065
Mrs. A. G. Kurth	Do.	71	1,069
*J. Zahl	Do.	65	1,046
H. B. Stephens	Do.	71	1,010
*C. Porter	Do.	53	1,006
O. W. J. Whitman	Do.	34	995
*T. B. Hawkins	Do.	51	989
Progressive Poultry Pens	Do.	80	981
Shaw and Stevenson	Black Leghorns	62	979
S. Wilkinson	White Leghorns	73	977
*J. W. Newton	Do.	61	968
B. Chester	Do.	70	960
H. F. Britten	Do.	68	958
P. O. Oldham	Do.	66	946
G. Williams	Do.	59	938
W. A. Wilson	Do.	79	920
R. T. G. Carey	Do.	32	909
A. W. Walker	Do.	72	878
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons	93	1,309
*D. Fulton	Do.	92	1,250
*R. Burns	Do.	101	1,203
*E. Morris	Do.	88	1,158
*A. E. Walters	Do.	84	1,148
*E. F. Dennis	Do.	60	1,132
*Mars Poultry Farm	Do.	88	1,129
T. Hindley	Do.	72	1,113
*W. H. Reilly	Chinese Langshans	90	1,100
*W. Smith	Black Orpingtons	96	1,089
A. Shanks	Do.	76	1,062
E. M. Larsen	Do.	75	1,050
*J. W. Macrae	Do.	87	1,017
T. W. Lutze	Do.	55	965
*F. A. Claussen	Rhode Island Reds	52	827
Jas. Fitzpatrick	Do.	48	774
H. Puff	Do.	43	763
W. J. Mee	Black Orpingtons	49	759
Totals	...	4,897	71,796

* Indicates that the pen is engaged in the single hen test

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	217	240	227	221	242	278	1,475
G. W. Hindes	267	228	220	240	233	219	1,407
E. Chester	244	220	220	244	229	216	1,373
T. Fanning	236	212	244	185	235	235	1,347
W. Becker	217	224	199	235	193	224	1 292
C. P. Buchanan	185	221	221	215	222	219	1,283
Mrs. L. Henderson	215	190	217	182	249	217	1,270
W. Lyell	207	235	227	197	205	197	1,268
Geo. Prince	187	233	200	234	204	207	1,265
G. Howard	205	200	223	289	186	201	1,254
G. H. Turner	154	147	240	223	275	210	1,249
Dr. E. C. Jennings	175	261	221	189	211	180	1,237
E. A. Smith	193	237	192	209	208	196	1,235
L. G. Innes	220	224	274	132	154	217	1,221
Oakland Poultry Farm	175	202	221	202	215	181	1,196
C. Knoblauch	222	193	217	187	167	207	1,193
R. Holmes	209	226	191	193	174	194	1,187
Range Poultry Farm	141	241	180	214	207	204	1,287
Quinn's Post Poultry Farm ...	240	190	184	142	226	191	1,173
Thos. Taylor	147	213	198	186	209	210	1,163
O.K. Poultry Farm	165	217	200	176	210	174	1,142
Mrs. A. T. Coomber	174	204	191	206	151	205	1,131
J. M. Manson	224	204	228	169	142	151	1,118
Homalayan Poultry Farm ...	216	183	172	146	202	188	1,107
Mrs. R. Hunter	168	189	133	191	2 9	208	1,098
J. Zahl	213	171	197	198	156	111	1,046
C. Porter	158	172	172	181	110	213	1,006
T. B. Hawkins	205	137	182	152	148	165	989
J. W. Newton	190	214	122	128	182	132	968
HEAVY BREEDS.							
Nobby Poultry Farm	259	228	206	123	241	252	1,309
D. Fulton	262	189	186	194	169	250	1,250
R. Burns	180	208	170	189	256	200	1,203
E. Morris	167	184	205	233	200	169	1,158
A. E. Walters	170	210	149	214	203	202	1,148
E. F. Dennis	229	170	192	132	208	201	1,132
Mars Poultry Farm	204	204	160	196	185	180	1,129
W. H. Reilly	186	198	196	156	151	213	1,100
W. Smith	245	183	143	174	156	188	1,089
J. W. Macrae	124	146	183	180	199	185	1,017
F. A. Claussen	137	141	149	145	148	107	827

ANTI-COCKROACH SUBSTANCES.

1. Sodium fluoride was found to be the most rapid killer of roaches of all substances tested. Only twenty-four hours were required to kill 100 per cent. in cage tests, even when the material was diluted down to 18 per cent. content. Practically 100 per cent. were killed in treated kitchens by the use of a mixture containing 50 per cent. sodium fluoride.

2. Borax, unadultered, and in combination with inert matter wherein there was less than 12 per cent. borax, required from three to seven days to kill all of the roaches in cage tests, proving it to be very slow. Borax, used alone, was only partially effective in kitchen tests.—U.S. Department of Agriculture.

The Orchard.

CO-OPERATION AMONGST FRUIT GROWERS.

We have, in previous issues of the journal, published several articles on the advantages of co-operation in the disposal of orchard produce. So far back as 1896 an important paper on this subject was read by Mr. A. Lorie, general manager of the Teviot and Alexandra Fruit Growing Company, at the Conference of Australasian Fruitgrowers held at Wellington (New Zealand), in which he discussed the whole question of co-operation, the result being that the company mentioned held the proud position of being the most independent body of fruitgrowers in the then colony. History repeats itself, and to-day we find the fruitgrowers of the North Coast of Queensland combining to ship their fruit by special trains direct to Sydney and Melbourne, under arrangements made with the Commissioner for Railways. The whole scheme is clearly set forth in the following letter received by Mr. A. H. Benson, Director of Fruit Culture, Queensland Department of Agriculture, from the secretary of the North Coast Fruitgrowers' Association, dealing primarily with the dispatch of special fruit trains to the Southern States, by means of which Queensland fruit can be landed in Melbourne in four and a-half days from Gympie. Already several of these special fruit trains have continued to run weekly since 30th January, and heavy consignments have been forwarded direct to the Southern capitals, thus avoiding the inevitable losses previously experienced by the process of unloading from train to steamer, and additional losses owing to the length of time in transit and other difficulties under the old system.

Following is a report on the progress of the scheme, which should recommend itself to all fruitgrowers throughout the State where direct railway communication with the Southern States is available:—

FRUIT TRAIN TRANSIT TO SOUTHERN STATES.

The transit of Queensland fruit to the Southern States has for a number of years attracted the attention of the various growers. The present methods, boat and rail, have been exceedingly unsatisfactory, more especially during our summer months, the former owing to the heavy risk of the fruit becoming overheated and boiled, and the latter owing to the length of time taken in reaching its destination.

Some two and a-half years ago, at a meeting of fruit-growers held in Brisbane, under the superintendence of the Department of Agriculture, the question of a fast fruit train service to the Southern States was spoken of.

The initial stage of broaching the subject to the Queensland Railway Commissioner was undertaken by A. C. Elphinstone, Esq., M.L.A., and then afterwards by the directors of the Queensland Co-operative Fruitgrowers, Limited, who went so far as to ascertain the feeling of the fruitgrowers along our North Coast line as far as Gympie, but there the subject was allowed to drop. However, during December, 1918, Mr. J. T. Wilson, of Woombye, took the matter in hand with determination, and after

interviewing the Railway Commissioner and obtaining from him the assurance that for a guarantee of £200, with a minimum load of 75 tons and a maximum of 112 tons, the fruit could be landed in Melbourne in four and a-half days from Gympie. The freight was reduced by about 25 per cent. for consignments of 6-ton lots, and required to be from one consignor to one consignee.

Mr. Wilson, with this assistance from the Railway Department, undertook the organising of the fruitgrowers on the North Coast line. As a result of his organisation, combined with the growers' support, the Railway Department on 30th January, 1919, was enabled to run its first fast fruit train to Wallangarra. This train consisted of twenty-three wagons, the tonnage of fruit being about 160 tons when it left Caboolture, and comprised chiefly pineapples and bananas. Since that date the train has continued to run weekly (every Thursday), and so far the weights carried have been respectively 86 tons, 180 tons, 120 tons, and 221 tons, while an extra train in February on the Tuesday carried 111 tons; another special fruit train on Thursday, 6th March, carried 190 tons, thus showing what can be done by co-operation. The Department are asking if a three-train service per week could be arranged, so that the loading could be distributed more evenly. This is an exceedingly difficult matter, as our climatic conditions are a large governing factor in the gathering of the various fruits, and will need the very careful attention of growers. These huge consignments, though handled expeditiously by our own Railway Department, have somewhat taxed the carrying capacity of the New South Wales Department, caused through the great distance which they have to haul the empty wagons from Sydney to Wallangarra. If growers would but organise and introduce a scheme whereby the Department's wish for a three-train service per week could be ratified, then will the fruit be landed in Melbourne at its guaranteed time and the market supply be more evenly regulated. In respect to organisation, an association composed of fruitgrowers and called "the North Coast Fruitgrowers' Association" has been formed, and embodies the districts between Caboolture and Gympie, and including the Kilcoy and Mary Valley lines. This association is out to watch all items of interest to fruitgrowers, and to band them together for mutual benefit. It therefore behoves all growers who have their own welfare at heart to assist this association, which has undertaken the guaranteeing of the fruit train. Therefore, fruitgrowers, assist your fellow-growers by co-operation and keep the fruit train running.

To the above, Mr. F. J. Young has supplied the following particulars to Mr. A. H. Benson, Director of Fruit Culture:—

List of Stations with Tonnage of Fruit carried on the First Seven Fruit Trains, 30th January to 4th March, 1919.

	Tons	cwt.	qr.	lb.
Amamoor	3	0	0	0
Gympie	38	19	0	0
North Arm	3	7	0	0
Cooroy	69	18	0	0
Eumundi	20	7	0	0
Yandina	31	12	0	0
Nambour	200	15	0	0
Woombye	249	6	0	0
Palmwoods	299	7	0	0
Eudlo	20	0	0	0
Landsborough ..	33	15	0	0
Glass House Mountains	43	0	0	0
Pomona	0	7	2	0
Beerburrum	11	0	0	0
Mooloolah	3	8	0	0
Beerwah	24	10	0	0
Traveston	1	7	0	0
Total ..	1,053	18	2	0

Tropical Industries.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

"The unprecedented dry weather, for this time of the year, is having a rather serious effect upon the late-planted cane. It is just the condition for the rapid development of the cane grubs; and they are already beginning to show, by the yellowing of the cane, in a few places, at the Greenhills Estate. Out of 181 greyback grubs picked up behind the plough, 22nd January, in the field of ratoons, E1, 68 were in the first stage, 112 in the second, and 1 had already reached the third or final stage. Digging under the yellowing stools of ratoons in E2, 5th February, I found an average of six grubs, mostly in the second stage. This field is in the worst infested area, and suffered severely last season, so it is not surprising to find that these infested stools have no roots, and can be easily pulled out with one hand.

"It will be of interest to record that greyback beetles were still in evidence on the feeding trees, 5th February, and dissection showed that these stragglers were full of eggs. This was just about two months after the first beetles emerged in this district, so the period for cultural control has been somewhat extended.

"I have improved the opportunity during the past month for securing further data on controlling factors—both better cultural methods, and the all-important one of feeding trees.

"BENEFITS OF INTENSIVE CULTURAL METHODS.

"Recently I was most gratified by an interview with Mr. David Hunter, a man of long experience in the sugar industry on the Johnstone; and his record as a grower has been so successful, especially in the handling of grub-infested land, that his observations should have the greatest value.

"Mr. Hunter first came to the district about twenty-eight years ago, taking charge of land for the Colonial Sugar Refining Company, for they grew their own cane at that time. He was quick to notice the value of filter-press on cane land, and became an advocate of intensive surface cultivation.

"About 1906 he took on one of the company's farms, which had been thrown out of cultivation for years because of the grubs. This pest had been so severe in the early days that the land was not considered profitable to grow cane; hence he got the place on very reasonable terms, and, being near the mill, he made arrangements for the complete output of compots. Mr. Hunter began applying this in 1908, and by thorough cultivation he soon had the farm in perfect tilth—not a weed in sight anywhere, and he kept the cultivators going so that none would show.

"I was interested to learn that Mr. Hunter believes filter-press is rather attractive to grubs, and that he found ammonium sulphate to be the opposite. Anyway, he says that he has seen cane treated with this latter chemical standing and perfect while untreated cane alongside had fallen because of the grubs. He does not agree with the usual statement, that ammonium sulphate robs the soil, for he is in accord with the most up-to-date knowledge of fertilisers. He says that there is no question that this chemical brings about a bumper crop, hence a portion of all the available plant foods are used up, and these must be renewed from time to time. For this purpose he used meatworks manure. He also returned to the soil all the waste from the crop—no trash was burned. He accomplished this by relieving into every other row, when the plant crop was cut, and applied manure and cultivation in the free middles. The trash from the first ratoons was relieved into the middles which had been cultivated, and the alternate ones were broken up and fertilised. Finally, the trash from the second ratoons was left, and the whole thing ploughed in. He used this regular system of three crops before ploughing out; and says that late planting is the thing for that class of soil. It is needless to say that he had no trouble from grubs.

"Then, too, results were apparent in the crops that he took off, for these doubled or trebled those of adjoining farms, and in one case, I found by the mill records, he cut 43 tons per acre when his neighbour across the road, on the same class of soil, cut 9 tons—the difference being due entirely to better methods.

"THE QUESTION OF FEEDING TREES.

"Mr. Hunter is also a thorough believer in the destruction of feeding trees, for he says that the grubs move back as the scrub is felled. He advocates removing the scrub and pasturing the land for half-a-mile back from all cane areas, using cane pest destruction funds to assist in this work. He said that the owners of the scrub would, of course, pay part, and the mills could make use of some of the wood to help out on the expense. Cost of felling and burning would be, approximately, £5 per acre at this time.

"Mr. C. E. Jodrell, who is another pioneer of the Goondi District, also gave me some of his very valuable observations. He is one of the most extensive growers to-day; and came on to his farm, in the stumps, twenty-five years ago. In those early days the grubs often ate everything out, so it was the exception to get even a 15-ton crop. He told me that the beetles were then in hordes in the feeding trees just behind his house; and that the flying foxes made havoc among them, so that the remains of the beetles were several inches deep on the ground in the morning. He said that he could plainly see the broken parts of the greybacks in the excrement of the bats.

"I was interested to learn that there has been no trouble from grubs on this farm since the scrub was cut on the hills surrounding it, about eighteen years ago.

"Mr. Jodrell also owns a farm at Daraji; and he told me that he always had trouble from grubs on the part bordering the scrub, but that there is no injury in the fields lying about half a mile away from these feeding trees.

"Mr. Ernest S. Smith, cane inspector at Goondi Mill, from his extensive observations in the district, is emphatic in his belief that the proximity of the feeding trees accounts for grubs in the soil. He told me that it is a well-recognised fact that grubs, which were once very serious throughout the Goondi District, have disappeared as the line of scrub has been moved back. It is now only the land lying within half a mile of the scrub that is affected. He could not recall a single instance where fields further away from the feeding trees were troubled.

"That it is not the length of time that land has been cleared that makes it immune, Mr. Smith cited the Innisfail Estate, which was opened up about thirty years ago, and it is still troubled badly with grubs every year, simply because it is bordered by scrub, for the same class of land on the town side of the river is not infested.

"In October, 1917, I called attention to an interesting observation along this line by Mr. W. Walker, who has been a resident of Macknade district for the past forty years. He said that he used to notice a very definite relation of infestation to a particular fig-tree in his fields. He found that the beetles usually went from this feeding tree with the wind, and infested the cane on that side, at some distance from the tree more than immediately around it.

"This suggestion bears fruit when we study an estate like Greenhills, where there is always a considerable portion infested. For two seasons I have been collecting data as to the distribution of the grubby areas, and have indicated these upon a carefully drawn map, using degrees of shading to show relative abundance.

"Examination of this map points clearly to the fact that the infested fields lie largely within one-half mile of the feeding trees, and, also, that the prevailing winds, from the south-west, are largely responsible for bringing the beetles from the feeding trees, which are abundant in that direction. Attention should be called to the fact that there is a considerable area of the estate which is considered land safe from infestation, and though part of this is bordered by the forest to the east, the cane is little infested, evidently because the prevailing winds blow away from these fields into the feeding trees.

"It must be kept in mind that cane is not at all essential to the beetles in their development, for they do just as well in grass land; in fact, the wild grasses are their native food plants. It is interesting to note in this connection that the greybacks are very abundant, even up on top of the range, where there is no sugar-cane for them to feed upon. The only reason that they become such a pest in some of our fields is that we have subjected them to abnormal conditions by removing their native food plants, and destroying all humus in the soil by our destructive methods of farming—taking off the crop every year and even burning all the trash.

"Careful measurements in the region about Meringa, where the cane has suffered severely from grubs for years, show that all the infested fields lie well within the one-half mile limit from feeding trees. Here the worst infestation was on the high ground, where the beetles would naturally come to rest from their flight. It must also be noted that these high spots are naturally poor in humus, and consequently the work of the grubs is more quickly noticeable.

"FIELD EXPERIMENTS.

"The cane in the cultivation plots at Greenhills is at present looking well, especially the plant cane in fields D1 and D2. Unfortunately, I was unable to get the cultivation started as early in the flight of the beetles as I desired, and in the ratoon field E1, it was almost a month late in some of the plots, so that small grubs were turned up at the very first treatment. All three of these fields border the feeding trees, and have always been the ones most infested, so we are hoping for some rather conclusive results, in spite of our late start.

"The fields L6 and L7 are in the badly infested area, but, as I have previously noted, a successful crop was secured from these at the last cutting. The lower half of L6 was planted near the end of September, 1917, and after late cultivation, produced an excellent crop. The upper half, planted in June, 1917, was a failure, because of the grubs, which put the cane down in February, 1918. The field L7 was planted about the first of October, 1917, but had rather poor cultivation, and was pretty weedy. In spite of this, however, the crop was fair, indicating that even the horse work that it did get disturbed the grubs so that they were held in check."

STERILISATION OF TOBACCO SEEDS.

TOBACCO SEEDBEDS.

STEAM AND OTHER METHODS.

In tobacco production, to grow the right sort of seedling plants is of special importance. Successful transplanting from the seedbed to the field requires vigorous seedlings, and the growth of the crop in the field, especially in the early stages, is largely dependent upon the character of seedling used. Great importance is to be attached to securing strong, healthy seedlings. The young plants in the bed are liable to be injured, and therefore it is necessary to protect them from parasitic and other enemies, which may injure and retard their growth or even kill them. Chief among these enemies are weeds and certain fungous diseases, especially rootrot. Spots in the beds are also frequently found where the soil conditions are such that normal development cannot be attained, says the writer of a bulletin issued by the United States Department of Agriculture.

These difficulties can be eliminated or greatly reduced by the sterilisation of the seedbeds, which now is recognised as an important feature in tobacco growing. Seedbeds are sterilised for the control of diseases and to kill weed seeds and hibernating insects. When properly done, the saving in weeding costs usually pays for the whole operation of sterilisation. The process has the additional advantage of insuring freedom from diseases and the production of more vigorous seedlings.

Sterilisation by surface burning has been widely practised for generations in the South, and, in fact, has been used at one time or another in nearly all tobacco districts. In the Southern districts it has been customary to select each year a new location for the seed bed, and the chief object of burning has been to free the bed from weed seeds.

In the Northern districts permanent seedbeds with glass covers are in more or less general use, and the widespread appearance of fungous diseases, especially rootrot, has made some sort of sterilisation necessary. Since open fires are impracticable in these districts, a process of steam sterilisation has been worked out, which now is used extensively in the cigar-leaf producing districts of the Connecticut Valley, Pennsylvania, and Wisconsin, and has been employed with success in several other sections, notably in western Kentucky and Tennessee, and in the Burley District. This method is both economical and effective, and with more or less modification is adapted to practically all tobacco-growing districts.

The steaming of the soil is the most satisfactory method of sterilisation which has been developed up to the present time. The direct application of the steam to the soil by means of an inverted pan or hood has now been in successful operation for a number of years. Thus far this process has been most extensively employed, perhaps, in the Connecticut Valley, but because of its many advantages and its effectiveness it is being widely adopted in other tobacco-growing districts.

PREPARATION OF SEEDBED.

The seedbed is thoroughly prepared in the usual manner for sowing the seed. The soil is well worked, the fertilisers spread and mixed in the soil, and the bed brought to fine tilth, so that after the steaming is completed it is only necessary to

rake the bed lightly before sowing the seed. It is important that nothing but the seed and the diluting material, also sterilised if necessary, should be added to the bed after sterilisation.

A comparatively dry bed is the first requisite for successful steaming, as it is practically impossible for the steam to penetrate wet soil. Glass-covered beds may be dried with comparative ease by covering them with sash several weeks before steaming. The bed is protected from the rains and snows of spring, and the sun's rays warm the soil and drive off excessive moisture. Cloth-covered beds may be protected for two weeks before steaming when rain or snow threatens by stretching over them cloths which have been painted with a thin mixture of linseed oil and drier.

Effect of Frost.

The presence of frost in the surface soil retards the penetration of the steam and makes it necessary to continue the process for an unusually long period. The ground must first be thawed before the desired heating can be brought about, and this causes a fuel consumption more than double that required where the soil is in proper condition. Where there is frost in the surface soil the steam does not penetrate more than a few inches, because of the condensation of the steam in the cold ground.

In order to thaw out the seedbeds before steaming, a good practice is to cover them with glass for several weeks, as has been suggested for wet beds. The glass allows the heat from the sun's rays to be confined within the bed during the day, warming the soil, and putting it in a mellow condition. Without such preparation even partial sterilisation would be impossible in some sections till late in the spring.

Use of Formaldehyde.

When steam sterilisation cannot be used, formaldehyde may be employed to control seedbed diseases. One gallon of commercial 40 per cent. formaldehyde solution is diluted in 50 gallons of water. This solution is applied at the rate of two quarts per square foot of seedbed, using a common sprinkling can.

The seedbed should be prepared for sowing, and to do the most effective work the soil should be dry enough to absorb all of the formaldehyde solution. To prevent the washing of the soil, the necessary quantity should be put on in a number of applications, at intervals of, say, 20 to 30 minutes. When all the solution is absorbed the bed should be covered with blankets for twenty-four hours to confine the fumes. It should then be aired for eight or ten days to allow the escape of the fumes from the soil. The seed should not be sown so long as there is a trace of the formaldehyde, for this will kill the germinating seed or young seedlings.

The use of formaldehyde is recommended only when steam sterilisation is not practicable. Its cost is greater than the cost of steaming, and it is usually less effective.—"Town and Country Journal."

THE DESIRABILITY OF INCREASING OUR SUGAR PRODUCTION.

By Harry T. Easterby, General Superintendent, Bureau of Sugar Experiment Stations.

It is an unfortunate fact that the sugar-mills of Queensland during the past fifteen years have, on the average, never been supplied with cane to much more than 50 per cent. of their capacity. The Northern sugar-mills have a better record in this respect than those from Mackay to the South, due largely to better climatic conditions for the growth of cane, but even many of these mills do not receive anything like the cane they could crush, except in abnormal seasons like 1913 and 1917. There is at present existing in this State sufficient milling power to manufacture 355,000 tons of sugar, but the largest tonnage ever turned out in any one year to date amounted to 307,714 tons in 1917. The average production for the fifteen years prior to and including 1917 was only 176,000 tons of sugar in Queensland. It is true that, owing to the erection of three new large mills in Queensland since 1913, the average production has been raised, but we have still a long way to go before our existing sugar factories are fully utilised. I am not for one moment suggesting over production, of which there is at present very little fear, it having only occurred once during many years, while the difference between our average production and the Australian consumption leaves a great deal to be desired. It will, of course, be objected that climatic factors have a very great deal to do with limiting crops, and this is undoubtedly true, but there is a great deal to be done in improving our production per acre, apart from this objection; and even droughts may be minimised

to a large extent by proper methods of cultivation, of which more hereafter. The Commonwealth is looking to Queensland to keep Australia supplied with sugar, and I am inclined to think that the Federal Government will maintain such a price as will warrant canegrowers supplying the demand. It is neither patriotic nor good business to send hundreds of thousands of pounds out of this country to purchase sugar grown by cheap black labour at a time when every sovereign is required within the Commonwealth, especially as the countries from whom sugar is bought do not take much from us.

The Federal Royal Commission which dealt with the industry said: "The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, wealth, or of production; it is primarily and essentially a problem of settlement and defence.

"The supreme justification for the protection of the sugar industry is the part that the industry has contributed and will, we hope, continue to contribute, to the problem of settlement and defence of the northern portions of Australia."

These questions are unfortunately little understood in the Southern States, where a clamour for cheaper sugar is frequently made by interested parties, as well as by the Press. If the white labour ideals of Australia are to be maintained, the consumer must be prepared for some little sacrifice, and I believe that he would have no objection to make it if he knew the facts as we know them.

The war has had a deterrent effect upon production in Queensland owing to the enormous increase in price in every article used by sugar-growers. Now it is happily over, we may hope for cheaper implements, fertilisers, and commodities generally.

We have now to consider in what way cultivation may be stimulated and increased.

First.—The completion of the North Coast Railway line will have the greatest effect in this direction, and all energies should be bent towards the rapid building of those sections still in progress.

Secondly.—Cheaper freights on lime and fertilisers should be made a leading plank in the farmers' platform.

Thirdly.—The use of tractors by the larger farmers will have a decidedly favourable effect in enabling more work to be done in a limited time.

Fourthly.—The growth of better varieties. This now being a bread-and-butter matter, owing to the establishment of Cane Prices Boards, will greatly tend to a larger production of sugar and better prices for the grower, while the miller will also be benefited by better canes entering into manufacture.

Fifthly.—The burning of cane should be discontinued and even prohibited. The loss to farmers and millers alike is considerable, first, by loss of weight, and, secondly, from the destruction of sugar and difficulties of manufacture.

It is, however, from better methods of cultivation that we shall derive the most part of our increased production, and it would be well to devote a portion of this article to the subject. While we have many intelligent cane farmers in Queensland, who are up to date in most respects, there are still a large number who do not get all they should from their farms. Thorough cultivation, both before and after planting cane, should be made a golden rule by all growers. The soil should be well broken up to begin with and deeply ploughed. Further cross ploughings should then take place, at least to the number of four. Liming should also be practised, because, owing to the long-continued growth of cane upon the same land, the soil in the majority of cases has become acid in reaction. Now it is a well-known fact that soils with an alkaline reaction are much to be preferred for sugar crops. In order, therefore, to sweeten up the soil, act as a deterrent of disease, and render soil more friable, the application of at least 1 ton of lime per acre every four or five years is strongly to be urged. There are many other benefits to be obtained from a dressing of lime, which may be summarised as follows:—

1. It acts on dormant mineral matter and renders available phosphoric acid and potash which would otherwise remain inert.

2. Acts on organic matter and converts part into nitrogen compounds available for the crop.

3. Enables the plant to make the greatest use of artificial fertilisers.

4. With moisture and warmth it favours the maintenance of abundant bacterial life, especially those forms which aid in nitrification.

5. It develops the activity of root bacteria in leguminous crops. In soils with an acid reaction the fixation of nitrogen from the air is frequently at a standstill.

Lime is usually applied to soils either as burnt lime (lime oxide), air-slaked lime (principally lime carbonate), water-slaked lime (lime hydrate), or as pulverised limestone. The very high price of lime in many sugar districts in Queensland renders its application an expensive business. This is largely due to the freights charged, and when it is considered how largely dependent the Northern steamship traffic is on the sugar industry, one would think that it would pay the shipping companies to carry such articles as lime and fertilisers at nominal rates in view of the increased business that would result from the extra output of sugar, the greater prosperity of sugar-farmers and others, which would enable them to more frequently travel, and the carriage of a larger number of labourers to deal with enhanced crops.

A further method of increasing production is by practising some method of rotation. This, in the case of cane, is best done with a leguminous crop.

Nitrogen is the soil element that becomes the most quickly exhausted, as it is also the element that is the most expensive to purchase. The nodules upon the roots of leguminous crops, under favourable conditions, are the abode of countless thousands of bacteria, being themselves minute living plants which have the power of seizing nitrogen from the air. In this way a leguminous crop may get from the atmosphere from 100 to 200 lb. of nitrogen per acre, which, at the present price of nitrogen in organic fertilisers, is worth, say, from £4 to £8.

There are other advantages in ploughing under leguminous crops, which may be summarised as under:—

1. During growth, the ground is shaded and moisture is conserved.
2. Erosion of fine earth is prevented during heavy rains.
3. Weed killing is promoted.
4. The deep tap roots of leguminous plants bring available plant food from the subsoil to the surface soils.
5. The interposition of a crop other than cane will act in minimising fungoid diseases and insect attacks. If the habitat of parasites attacking the cane is removed for a time, it must result in their dying out or of their disappearance.

All cane farmers should rotate in some way or another; thus, where corn will grow, cowpeas and corn make a fine rotation and will pay well.

The greatest supervision should be exercised at the time of planting, so that only good, sound plants, free from disease, are selected. Top plants are usually considered the best, but bottom plants have also been found to give a high percentage of germination. It is preferable for a farmer to change plants with a neighbour rather than grow cane continually from his own seed. Cane brought from a colder climate to a warmer one invariably does well.

The best width of the row has been found from numerous experiments in Louisiana, Hawaii, and Queensland to be 5 ft. In the case of a straight-growing cane like D1135, this could be reduced to 4 ft. 6 in. with advantage during normal seasons. Three-eye plants are usually considered the best to use, dropped in the furrow about 6 in. apart. The depth of planting and amount of covering can safely be left to the farmer's own judgment, as conditions vary so much in different districts. Labour can be saved at this stage by the use of the cane planter, a machine which is being increasingly used on our cane farms.

As soon as the cane is up about 6 in., the subsequent shallow cultivation should commence, and this, if properly done, is a factor which materially contributes to the success of the crop.

The importance of subsequent cultivation cannot be too strongly emphasised. One of the world's leading authorities upon the culture of cane (Professor Stubbs, of Louisiana) says: "The cultivator should be run as frequently as possible, so that a thin layer of earth is removed from the great body of soil and laid as a mulch upon the surface. In this way the continuous upward movement of moisture through the soil into the air is checked just below the surface, so that roots of plants can appropriate it. The finely divided earth on the surface has the power of attracting hygroscopic moisture from the air—a not insignificant fact in times of drought, with heavy dews at night." The question may be asked: "Which best promotes the above advantages, the cultivator, which stirs only to a limited depth and never inverts, or the plough, which runs 6 to 12 in. deep, completely inverting the soil and burying plant foods and ferments beyond resurrection for the growing crop? The plain and candid reply is—the cultivator. Again, but little stress has been laid upon the damage done by the frequent cutting of the cane roots by ploughs, a damage often fatal to good crops." So impressed were Louisiana farmers by this reasoning that they many years ago abandoned the cultivation of cane between the rows with the plough.

Professor Hilgard (Soils) says: "The loose tilth of the surface, which is so conducive to the rapid absorption of the surface water, is also, broadly speaking, the best means of reducing evaporation to the lowest possible point. . . . It is true

that relatively coarse compound particles are incapable of withdrawing capillary moisture from the dense soil or subsoil underneath, just as a dry sponge is incapable of absorbing any moisture from a wet brick, while the dry brick will withdraw readily nearly all the water contained in the relatively large pores of the sponge. A layer of loose, dry surface soil is therefore an excellent preventive of evaporation, and to moderate the access of excessive heat and dryness to the active roots.''

If the cultivation of a plant crop has been carried out as indicated, fertilisers should not be necessary, but it is always wise, in seasons of average rainfall, to apply manures to ratoon crops. These should be mixtures of nitrogen, potash, and phosphoric acid as having given the best results when used with cane. Potash, though scarce at present, should soon be on the market again at reasonable rates, according to late advices.

It has been shown that a crop of cane of the variety known as HQ426, sixteen months old, removes from the soil 163 lb. potash, 83 lb. phosphoric acid, and 96 lb. of nitrogen per acre, thus showing the necessity for the renewal of these elements by fertilising.

Ratoons should also receive thorough and frequent cultivation, in order that they may be made to produce as much sugar as possible.

In these ways production could be materially increased in a manner profitable to the worker, grower, miller, State, and Commonwealth.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1919 AND 1918. FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1919.	Feb., 1918.
	In.		In.	In.
North Coast.				
Atherton	9·67	17	1·81	9·62
Cairns	14·93	36	7·85	18·06
Cardwell	17 02	46	8·88	16·98
Cooktown	13·61	42	10·29	13·48
Herberton	7·49	31	2·81	10·02
Ingham	15·65	26	6·05	18·40
Innisfail	22·07	37	11·32	20·07
Mossman	15·13	10	16·46	14·55
Townsville	12·16	47	8·36	7·12
Central Coast.				
Ayr	9·43	31	2 54	8·30
Bowen	8·79	47	3·73	14·66
Charters Towers ...	4·40	36	2·21	11·26
Mackay	11·77	47	6·05	9·89
Proserpine	10·96	15	4·94	13·34
St. Lawrence ...	8·26	47	1 55	7 49
South Coast.				
Biggenden	3·89	20	2·71	4·15
Bundaberg	6·45	35	3·22	5·62
Brisbane	6·48	68	0·89	2·25
Childers	6·17	23	3 77	8 89
Crohamhurst ...	15·03	25	3·10	7·88
Esk	5·94	31	0·53	2·18
Gayndah	4·26	47	1·93	5·31
Gympie	6·75	48	2·63	7·28
Glasshouse M'tains	9·50	10	2·71	9·03
Kilkivan	5·24	39	1·83	4·07
Maryborough ...	6·67	47	2·40	7·39

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1919.	Feb., 1918.
	In.		In.	In.
South Coast—continued:				
Nambour	8·96	22	5·06	5·67
Nanango	4·54	36	2·58	2·91
Rockhampton ...	7·82	31	3·31	8 20
Woodford	9·32	31	2·36	9·33
Darling Downs.				
Dalby	2·98	48	3·38	2·17
Emu Vale	2·39	23	1·54	1·13
Jimbour	3·0	31	2·13	0·42
Miles	2·75	33	1·29	3·36
Stanthorpe ...	3·45	45	2·58	0·86
Toowoomba ...	4·57	46	0·76	2·26
Warwick	3·05	31	2·24	2·30
Maranoa.				
Roma	3·17	44	3·33	0·36
State Farms, &c.				
Bungeworgorai ...	2·50	5	5·15	0·45
Gatton College ...	3·17	20	0·55	1·59
Gindie	2·94	20	1·57	5·84
Hermitage ...	2·48	13	2 97	1·59
Kairi	7·24	5	2·65	*
Sugar Experiment Station, Mackay	10·44	22	6·75	11·77
Warren	3·92	4	2·55	10·96

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision. * Not received.

GEORGE G. BOND, State Meteorologist.

Science.

A SUN PROPHECY FULFILLED ON EARTH.

The following remarkable communication from a correspondent was published in the *Agricultural Journal*, Natal, 1900.

A prophecy of drought, heat, and famine over a large portion of the world, to continue up to the present year, made by Mr. Douglas Archibald in the *Westminster Gazette* of 19th March, 1897, "has been verified in almost every detail." So says the *Philadelphia Press* of a recent date. The actual prophecy referred to was contained in the following passage: The wave of tropical drought has not come to an end yet, and when it does the sunspot effect would tend to prolong it through the period of minimum which is due in 1900. At such times it is very rare for the tropical rains to be plentiful or well distributed, which latter is an important factor in regard to the growth of crops.

Consequently, though it is unpleasant to be a prophet of evil, the fact that an extra tendency to drought is just now coincident with a sun which is approaching its recurrent period of freedom from spots gives us little ground for expecting a bumper monsoon to terminate the present distress in India. On the contrary, unless these remarkable changes which have occurred since 1892 are due to some cosmical cause unconnected with the sun which will disappear in a few months, we shall have to look forward to other droughts and famines before the arrival of the sunspot maximum of 1904.

Commenting on this, the *Philadelphia Press* says:

It must be clear from this forecast, which has been verified in almost every detail by the terrible second famine in India, and which is confirmed in the scarcely favourable monsoon which is now prevailing in India, that it is the infrequency of sun spots, and not their frequency, which gives us these hot waves. And that we are at a period of minimum sunspot activity we know, not only from the daily investigation of the sun, but by means of the eclipse of 28th May, when the corona was of that type always connected with an absence of sun spots.

Concerning the future, both as regards India and elsewhere, Mr. Archibald now writes to us as follows: "I consider that the present period of more or less continuous and pronounced tropical drought reached its culminating epoch in 1899, when the deficiency of rain over the entire Indian area amounted to 11.14 inches, or 25 per cent. below the annual average. This deficiency coincided with a very low Nile and generally drought conditions over very large tracts of Asia, Africa, Australia, and America.

"I believe it to be the greatest deficiency ever recorded in India, and to be partly due to the exceptional coincidence of a sunspot minimum and abnormal solar conditions with the culminating dry phase of the Brückner cycle.

"By 1904 the sunspots ought again to be at a maximum, and this same year marks the termination of the eighteen dry and warm years of the Brückner cycle and the commencement of the generally, and especially in the tropics, eighteen years wet and cold period.

"These joint considerations led me, in 1897, to name 1904 as the probable limit of the droughty period. I see no reason to modify the forecast I gave then, which our sharp Transatlantic cousins have so favourably noticed, beyond saying that the culminating point has probably been reached, and that between now and 1904 the tropical rains and monsoons will probably gradually become more normal in amount and distribution.

"I will also venture to say that between 1904 and 1920 there will probably be no droughts and famines in India of a magnitude approaching those of 1896 and 1899-1900; but that the period will be generally characterised by summer rains of a more normal character throughout the tropics.

"Similar characteristics will also affect the general weather in the extra tropics during the same years, although the sunspot changes usually affect certain latitudes—particularly the belt between 30 degrees and 40 degrees—oppositely compared with the remainder of the earth.

"In general where the harvest is more beneficially influenced by a good supply of rain than by drought and sunshine, the conditions ought to average better during

these years even near the Poles, especially in the years following the sunspot maxima of 1904 and 1915. If anything could accentuate this, it would be found in the remarkable curve of harvests in Finland traced by Dr. Lemström for the years 1810 to 1877 in his paper read at the Chicago Congress of 1893, which follows the curve of sunspots for the corresponding period in every detail.

"The areas, however, which are affected most seriously by the combined Sunspot-Brückner causes are chiefly the large continental areas near the Equator—such as Central India, Asia, Africa, and parts of Australia and America, and it is to these that my former and present forecasts more particularly apply."

DROUGHTS AND FLOODS.

In connection with the above article "A Sun Prophecy Fulfilled," published in this issue of the Journal, we have received the following remarkable calculation on droughts and floods from a correspondent:—

The droughts repeat in ones and twos, fives and eights, and the flood years are in the noughts and threes in each decade. The ones and twos droughts commence in the ones and last through the twos, and break up in the beginning of the threes; and the fours and fives begin in the fours, last through the fives, and break up in the beginning of the sixes. This has been verified, as we had droughts in—

1851-52, 1861-62, 1871-72, 1881-82, 1891-92, 1901-02.
1865, 1875, 1885, 1895, 1905, 1915.
1868, 1878, 1888, 1898, 1908.

All the ones and twos and fives and eights of each have been either medium or bad droughts.

Records of floods have been published for 1860-63, 1870-73, 1880-83, 1890-93. Thus, according to the above, we have the following table as a guide for all years:—

Years ending 1—Drought commences.
Years ending 2—Continues through this year.
Years ending 3—Breaks in the beginning and there will be floods.
Years ending 4—Drought begins.
Years ending 5—Continues through this year.
Years ending 6—Breaks in the beginning of this year.
Years ending 7—Plenty of rain. Good growing year.
Years ending 8—Drought commences.
Years ending 9—Continues through this year.
Years ending 0—Breaking in this and there will be floods.
Example—The years 1901, 1911, 1921, etc., all end with the figure one.

THE PURIFICATION OF WATER FOR BUTTER AND CHEESE FACTORIES.

By ARTHUR MORRY, Architect, Surveyor to the Department of Agriculture and Stock.

On several occasions during the recent severe drought, when water supplies were reduced to a minimum of questionable quality, advice has been sought as to the best means of converting an objectionable, and even offensive, fluid into a useful commodity. Water of good quality is essentially necessary in butter and cheese factories, especially freedom from organic impurities and bacterial contamination. That this is naturally impossible with water derived from surface streams or lagoons is well known, and that it is often so with water drawn from wells of shallow depth is also true because surface contamination easily takes place. In some soils wells of even 100 feet in depth are easily contaminated unless lined with some absolutely watertight material, and in such cases these waters are quite innocently believed to be perfect, a bore 100 feet or so in depth, lined with steel casing, may generally be expected to yield a supply free from organic impurities, but even this water may be greatly improved by subjecting it to a proper system of aeration. Bore waters are often highly charged with mineral elements, more or less objectionable, and are generally deficient in dissolved oxygen. In most butter and cheese factories pressure filters of some kind are used, and these rapidly become clogged with impurities, necessitating very frequent cleaning, and while they succeed in removing all matters in suspension, they do not impart to the water the dissolved oxygen in which it is often deficient. The method here suggested will deal with all classes of waters except those highly saline in character. It is not an experiment, as that stage

has been passed, and the principles advocated applied in practice with marked success. Although the writer is not aware of the application of this method to the purification of water for butter factory purposes, it is certain that the results would repay any factory for the comparative small cost incurred in its installation, in the saving of time now lost in the frequent cleansing of the pressure filters, and in depriving some waters of those characteristic odours which may be described as "fishy," "marshy," or "grassy."

In the year 1902 the writer suggested to the Brisbane Board of Waterworks a practical method for the purification of the water of the Enoggera reservoir, which had so far resisted all attempts at improvement, and it was proposed to expend a large sum, on the advice of the professional officers of the Board, in installing a chemical precipitation process which was not only expensive to instal, but would incur a large annual expenditure in maintenance and attention. The principle suggested by the writer had never yet been applied to the purification of potable water, and it differed radically from all methods previously experimented with, most of which involved precipitation of the impurities by the addition of one or more chemicals, settlement, and subsequent filtration through sand. In the bacterial method of treatment, as suggested, no chemical is added to the water and no precipitated matter has to be disposed of. It has been found that sand filtration removes only a small portion of the organic matter in solution, but it was expected that this method after being in operation for a short time would remove almost all the organisms present, because of the great excess of oxygen which was supplied during its passage through the filter. This suggestion was at first received with some derision and not a little scepticism by men who were regarded as prominent scientists. The Board, however, decided to give it a trial, and the results cannot be better described than by quoting from a paper read by the Board's Analyst before the Royal Society of Queensland on the 5th August, 1905, just three years after the institution of the tests. After naming other processes, the Analyst says:—"A method of water purification has been tried which, strictly speaking, comes under neither of the heads mentioned. This ingenious process was suggested by Mr. Arthur Morry, of this city, who, at that time, was District Supervisor of Public Works, and in that capacity had devoted a considerable amount of time and thought to the subject of water purification. The type of filter is described as 'Biological Oxidising Beds,' and consisted in passing the water through beds about 6 feet high, built up from the ground, and filled with gravel or coal in varying grades. In some of the filters, these beds are so constructed as to admit of side aeration, but the feature which is common to all is the method of delivering the unfiltered water on to the filter. This is done through an 'Intermitter,' from which the water is discharged at intervals into the basin of a revolving sprinkler running on ball-bearings, which distributes it regularly and evenly over the surface of the filter bed, through which it slowly percolates and flows into underdrains which lead into a small receiving vessel. The object of this method of discharging the effluent is to insure the thorough aeration of the water in its passages through the filters. That this has been effected is proved by the fact that even in the warmest weather the effluents from all but one of these filters contained over 95 per cent. of dissolved oxygen, and it has been proved that this aeration is chiefly produced during the passage of the water through the bed of the filter itself, the bacterial reduction effected being about 92 per cent."

These filters were subsequently known as the "Morry type" and the results generally were so good, effecting such a remarkable reduction in the organic matter and colour of the water, as to determine the Board, after consultation with an eminent American expert, to adopt the bacterial method of treatment as here explained for the Enoggera supply. The filters also attracted great attention throughout Australia, and were regarded as having solved what had hitherto been considered a very difficult problem. They can be used effectively in the treatment of water from swamps, and stagnant waterholes in creeks, removing the "grassy" or "swampy" taste and colour, and charging it with life-giving oxygen. They can therefore be usefully applied on stations and farms, being easily constructed, generally with local materials, while the mechanical arrangements are not difficult to obtain.

For the treatment of water, however, which has become polluted by earthy matter in suspension following heavy storms, some preliminary method of precipitation must be adopted, followed by oxidation, to get the best results. This is easily accomplished by passing the water through narrow channels of brick, concrete, or timber, in which thin slabs of almino-ferric are placed on edge—a combination of alum and iron—when sufficient is dissolved to cause precipitation of all matters in suspension—if the water is already alkaline—if not, a small quantity of lime must be previously added. After settlement the effluent is then pumped into the "Intermitter," from which it is at intervals discharged on the oxidising beds. The results will be seen in a beautiful liquid, sparkling like the mountain springs and imparting life, energy, and vivacity to its consumer.

LIME AND MAGNESIA IN QUEENSLAND SOILS.

By J. C. BRÜNNICH, F.I.C., Agricultural Chemist.

The great **need of applying lime** to a large number of Queensland soils has been repeatedly urged in this Journal, and this necessity arises from the fact that a large percentage of our soils are not only **deficient** in their **lime contents,** but that a still greater percentage contain **excessive amounts of magnesia.**

A collation of the results of the analyses of 1,773 samples of soils, carried out at our agricultural laboratory and at the laboratory of the Sugar Experiment Station, shows that these soils may be classified as follows :—

27·64 per cent. contain under ·25 per cent. of lime (CaO),
44·7 per cent. contain from ·25 to ·75 per cent.,
21·1 per cent. contain from ·75 to 1·5 per cent., and
6·8 per cent. contain over 1·5 per cent. of lime.

With regard to magnesia we find—

35·7 per cent contain less than ·25 per cent. of magnesia (MgO), and comparing the amounts of magnesia and lime we find that—

34·0 per cent. have a ratio of 1 ÷ 1 and over of MgO ÷ CaO and only

6·6 per cent. have a ratio of less than 1 ÷ 3 of MgO ÷ CaO., the importance of which will be explained later on.

In an **average good loamy soil,** a **lime content** of less than **·25 per cent.** is considered **low, ·25 to ·75 per cent.** of lime is **fair, ·75 to 1·5 per cent.** of lime is **good,** and over **1·5 per cent.** of lime **high.**

Soils containing less than **·25 per cent magnesia** may be considered **deficient** in this constituent.

It must be clearly understood, however, that this classification cannot be generally applied as a hard-and-fast rule, as in a **loose sandy soil** from **·25 per cent. to ·75 per cent.** of lime and ·25 per cent. of magnesia may be considered **good,** because on account of the good physical condition of such soil the plants develop a good deep root system, and can therefore draw their supply of plant foods from a much larger volume of soil than in a soil of heavy nature.

In **heavy clayey soils,** again, amounts of lime between **·25 per cent. and ·75 per cent.** must be considered **low,** more particularly if the amount of magnesia is high or higher than the amount of lime, which is a common occurrence in such soils.

A **magnesia-lime ratio** of **1 ÷ 1** or over is considered **unfavourable** to fertility, and for most crops the most suitable MgO ÷ CaO ratio is 1 ÷ 2 or 1 ÷ 3 or less.

In order to make the information collected from the soil analyses more generally useful, the districts or localities from which samples were obtained are grouped herewith in accordance with the classification mentioned above.

It is only natural that in some of the districts great variations in the quality and composition of the soils exist, and therefore many localities appear in two or more classes.

Low Lime Contents, under ·25 per cent., at:—

Abbotsford
Aldershot
Aloomba
Aspley

Barcaldine
Beerburrum
Beerwah
Bidwell
Buderim Mountain
Bulimba
Bungeworgorai

Cairns
Charters Towers
Childers
Cleveland
Comet Downs
Cooper's Plains
Cooroy

Dakabin
Dalby
Degilbo

Eight-Mile Plains
Eudlo
Eumundi

Gin Gin
Glass House Mountain
Gooburrum
Goodna
Goondi
Gramzow

Innisfail
Invicta
Isis

Kalkie
Kamerunga
Kedron
Killarney
Kin Kin
Kolan
Kuraby

Loganlea

Maleny
Maroochy
Maryborough
Miles
Mitchell River
Mooloolah
Moreton
Mossman
Mourilyan
Mount Bauple
Mount Gravatt
Mount Windsor
Mulgrave

Nambour
Nelson
Nikenbah
Noosa
North Arm
North Kolan
Nudgee
Nundah

Oakhurst
Oman-ama
Ormiston

Pialba
Pomona

Rosedale

Sandgate
Stanthorpe
Strathpine
Sunnybank

Tahiti
Tewantin
Thursday Island
Tinana Creek
Torbanlea
Traveston

Wallumbilla
Warwick
Wellington Point
Westwood
Woodford
Woody Point
Woombye

Yandina
Yengarie
Yerra

Fair Lime Contents, between ·25 and ·75 per cent., at:—

Aspley
Atherton
Avondale
Ayr

Baffle Creek
Barolin
Beenleigh
Benowa
Bingera
Birkdale
Birthamba
Blackbutt
Bowen
Buderim Mountain
Bundaberg

Caboolture
Charters Towers
Chinchilla
Cleveland
Comet
Coolabunia
Cooran
Cooroy
Cordalba
Crow's Nest
Cunnamulla
Currajong Creek

Dawson
Diddilibah
Doolby
Dulacca

Eagleby
Edenvale
Eton
Eudlo
Eumundi

Fairymead

Garrah
Gayndah
Gin Gin
Goodnight Scrub
Goodwood
Goombungee
Goondi
Goondiwindi
Gootchie
Graceville
Gympie

Halifax
Hambledon
Highfields
Homebush
Horton

Ingham
Inglewood
Innisfail
Invicta
Isis

Jardine

Kalkie
Kamerunga
Killarney
Kingaroy
Kuraby

Livingstone
Loganholme

Mackay River Flats
Manly
Mareeba
Marburg
Maroochy
Miara
Millaa Millaa
Moggill
Moreton
Mossman
Mount Basilisk
Mount Bauple
Mount Jukes

Fair Lime Contents, between ·25 and ·75 per cent., at—*continued*:—

Mount Taroom
Mount Morgan
Mulgrave
Mundubbera
Mungar Junction
Murgon

Nanango
Nambour
Nerang
Nudgee
Normanton

Oakwood
Ormiston
Oxenford

Perry Scrub
Pialba
Plane Creek
Proserpine

Ripple Creek
Roma

Samford
South Kolan
Sunnybank
Sunnyside
St. Helena

Taabinga
Tallegalla
Tamaree
Thanes Creek
Tinana
Tingalpa
Tingoora
Toowoomba

Wallumbilla
Warwick
Watawa
Wellington Point
Winton
Woodford
Woongarra
Worongary

Yandina
Yarraman
Yepoon
Yeulba

Zillmere

Good Lime Contents, ·75 to 1·5 per cent., at:—

Atherton
Ayr

Baffle Creek
Bajool
Barcaldine
Beaudesert
Beenleigh
Bethania Junction
Biggenden
Birkdale
Booyal
Bowen
Boyne Valley
Brookfield
Bundaberg
Burdekin

Calliope
Cambooya
Charters Towers
Childers
Clifton
Colington
Cunnamulla

Dawson Valley
Drayton

Esk

Farleigh
Fassifern
Gatton
Gayndah
Gin Gin
Greenmount
Gympie

Hermitage
Homehill
Hughenden

Jimbour

Kalkie
Kingaroy
Kirchheim

Laravale
Livingstone
Loganlea
Longreach

Mackay
Marburg
Marian
Maryborough
Mooloolah
Moreton
Mount Bartopp
Mount Garnet
Mount Kent
Mount Larcom
Mundubbera
Murgon
Nambour
Nanango
Nerang
Nundah

Oxenford

Plane Creek
Proserpine

Raglan
Rawbelle
Rosewood

Samford
Sunnyside

Tallegalla
Tarong
Te Kowai
Toogoolawah
Tuchekoi
Tweed Heads

Wallumbilla
Watawa
Waterview
Westbrook
Woodmillar Scrub

High Lime Contents, over 1·5 per cent., at:—

Albert River
Alton Downs
Atherton

Baking Board
Beaudesert
Beenleigh
Bindango
Booyal
Bowen
Calliope
Cairns
Cambooya
Cannindah
Capella
Clifton

Dalma Scrub
Dawson River
Don Delta
Dulacca

Farleigh
Flinders Siding

Gayndah
Goomburra
Gowrie Junction
Greenmount
Gympie

Hughenden

High Lime Contents, over 1·5 per cent., at—*continued*:—

Isis Downs
Kandanga Creek
Kingaroy
Kynuna
Marmor
Mary River
Mount Jukes
Mount Mee
Muan
Nobby
Perry Scrub
Plane Creek
Pittsworth
Raglan
Rosehill
Rosewood
Samford
Tarampa
Tawah
Warra
Warwick
Westbrook
Westwood
Wowan

Low Magnesia Contents, under ·25 per cent., at:—

Abbotsford
Aloomba
Aspley
Barcaldine
Beerburrum
Beerwah
Bidwell
Bingera
Birthamba
Buderim Mountain
Bundaberg
Cairns
Charters Towers
Childers
Chinchilla
Cleveland
Cooroy
Currajong
Dalby
Eton
Gin Gin
Glass House Mountain
Gooburrum
Goodna
Gootchie
Hambledon
Homebush
Horton
Ingham
Innisfail
Invicta
Isis
Kalkie
Kamerunga
Kingaroy
Kolan
Kuraby
Loganlea
Mackay
Marian
Maroochy
Maryborough
Miles
Mitchell River
Moggill
Moolooolah
Mourilyan
Mount Larcom
Mulgrave
Nambour
Nelson
Nudgee
Nundah
Oakhurst
Oakwood
Ormiston
Perry Scrub
Pialba
Roma
Sandgate
South Kolan
Stanthorpe
St. Helena
Tahiti
Tingalpa
Traveston
Wallumbilla
Watawa
Wellington Point
Woodford
Woody Point
Woombye
Woongarra
Yandina
Yengarie
Zillmere

High Magnesia Lime Rates, percentage of Magnesia equal or higher than per cent. Lime, at:—

Aloomba
Aspley
Atherton
Barcaldine
Beaudesert
Beenleigh
Bingera
Biggenden
Brookfield
Bundaberg
Cambooya
Dawson River
Drayton
Dulacca
Eagleby
Eudlo
Fairymead
Gatton
Gin Gin
Goodnight Scrub
Goodwood
Goondiwindi
Greenmount
Halifax
Hambledon
Hermitage
Ingham
Innisfail
Invicta
Isis
Johnson
Kandanga Creek
Kirchheim
Killarney

High Magnesia Lime Rates, percentage of Magnesia equal or higher than per cent. Lime, at—*continued* :—

Maleny	Nambour	Sunnybank
Marmor	Nerang	South Johnston
Maroochy	North Arm	
Miara	Nundah	
Miles	Nudgee	Tallegalla
Mitchell River		Tewantin
Mooloolah		Toowoomba
Moreton	Oman-ama	Toogoolawah
Mossman		Traveston
Mount Basilisk		
Mount Bauple	Perry Scrub	Wallumbilla
Mount Gravatt	Pialba	Warwick
Mount Garnet	Proserpine	Watawa
Mount Larcom		Westbrook
Mourilyan		Woodford
Mulgrave	Roma	
Mungallala	Rosewood	
Murgon	Ripple Creek	Zillmere

In the localities *underlined* the high Magnesia Lime ratio is particularly predominant.

The important **functions of lime** in relation to **soil fertility** and plant nutrition are well known and generally recognised.

Sir A. D. Hall, the late Director of the celebrated Rothamsted Experiment Station, as president of the agricultural section of the 84th meeting of the British Association for the Advancement of Science, held in Australia in 1914, stated in his opening address as follows :—

" Of all the soil factors making for fertility I should put lime the first ; upon its presence depend both the processes which produce available plantfoods in quantities adequate for crop-production at a high level and those which naturally regenerate and maintain the resources of the soil ; it is, moreover, the factor which is most easily under the control of the agriculturist."

Lime is an **indispensable plantfood,** intimately connected in the growth of the plant with the building up of proteins and carbohydrates, and neutralization of organic acids.

Lime has powerful **action** on the **physical properties of a soil**, and both as burnt lime and a carbonate of lime increases the **water-holding capacity** of soil.

Lime in the form of air-slaked **burnt lime** has the most powerful action on the soil structure, as it **coagulates the clay**, thereby increasing porosity of the soil and facilitates the percolation of water through the soil.

Further important functions are the **neutralization** of **organic acids** in the soil, and the **decomposition of injurious compounds.** Lime aids in the fixation of soluble phosphoric acid and prevents the formation of the more insoluble alumina and iron phosphates. Addition of burnt lime to a soil actually makes **phosphoric acid available** from insoluble iron and alumina phosphates. Lime has also some action on the insoluble **potash salts** in the soil, and increases their solubility in water, thereby rendering them more **readily available.** This action is particularly valuable

on heavy clay soils, but would lead to loss of potash in light sandy soils, and for this reason lime must be applied in form of lime carbonate (crushed limestone) to the latter soils.

Lime has a particularly powerful action in aiding **decomposition** of organic matter, the **humus,** in the soil, producing at the same time **soluble nitrogenous compounds** therefrom. Addition of lime produces neutrality or even slight alkalinity of a soil, which is necessary for the important process of **nitrification,** by which the organic nitrogenous compounds are gradually changed into **ammonia salt** and finally into **nitrates,** in which form alone the nitrogen can be utilised by the plants.

The presence of a sufficient amount of lime greatly increases the activity of **azoto-bacteria,** which are the agents of the **fixation of atmospheric nitrogen.**

Magnesia, which as a rule is found in sufficient amounts in the soil, is also an **indispensable plantfood,** as it is found in every living cell, and is a constituent of chlorophyl, the green colouring matter of plants.

In the seeds generally larger amounts of magnesia than of lime are found. The ash of maize is particularly poor in lime and rich in magnesia, containing on an average about 2 per cent. of lime, 13 per cent. of magnesia and 53 per cent. of phosphoric acid. The ash of wheat contains about 5 per cent. of lime, 14 per cent. of magnesia, and 40 per cent. of phosphoric acid.

In the leaves and twigs lime generally predominates, and leguminous plants, like clover and lucerne, contain large amounts of lime in their ash.

Magnesia salts found **in excess** in any soil act as a **plant poison,** and, as a matter of fact, magnesia salts can only be utilised for plant nutrition in presence of sufficient amounts of lime salts. As a rule, a **ratio of 1 part of magnesia** to **three parts of lime** is the **most favourable** for plant nutrition. Some cereal crops can tolerate higher amounts of magnesia, up to a ratio of 1 ÷ 2 and even 1 ÷ 1, whereas leguminous plants, which require much more lime, always do best with the ratio near 1 ÷ 3.

Dr. Voelcker has shown by experiments with wheat, carried out at the Woburn Experiment Station, that the **addition of magnesia** to a soil poor in this constituent will be attended with benefit as long as the amount of magnesia does not exceed that of lime, but if the magnesia be in excess, there will be diminution of produce. Magnesia appears to have an influence in producing greater leaf development and greener foliage, shorter straw, and later ripening; also changes in the nature of root system and character of the grain.

H. Rigaux has proved that in Belgium, where the soils are particularly poor in magnesia, containing only ·01 to ·04 per cent. MgO, manuring with magnesia salts (using 670 lb. of magnesium sulphate or Epsom salts per acre) gave very considerable increases in various crops—cereals, beets, and potatoes.

About ·25 to ·3 per cent. of magnesia in soils is considered a sufficient amount, and therefore in our soils, as a rule, enough, if not too much, magnesia is present.

In many of our sugar districts the **magnesia-lime ratio** is very **unfavourable,** more magnesia than lime being present. A sugar soil at Innisfail, for instance, contains only ·2 per cent. of lime and 2·2 per cent. of magnesia ; a scrub soil in the Bundaberg district contains ·65 per cent. of lime and 3·6 per cent. of magnesia. Such soils, in order to produce good crops, must be limed heavily, and it is only an economic question if sufficient lime can be applied to produce better results.

It is of interest to note that on a sugar soil at Porto Rico, reported to contain according to analysis made by P. L. Gile, ·60 per cent. of lime and 3·32 per cent. of magnesia, an application of lime at the rate of 3,000 lb. per acre increased the sugar-cane crop from 44 tons to 69 tons, whereas a simultaneous application of a rich manure only yielded 61·6 tons per acre.

The lime is generally supplied to soils in the form of **crushed limestone** (lime carbonate) or as **air-slaked burnt lime.** From the effects of lime already described it is easily understood that **burnt lime** is only necessary in **exceptional cases,** where a rapid action is required. For ordinary purposes of supplying lime the **agricultural lime** is to be **preferred.** In some cases a mixture of burnt lime and crushed limestone may be recommended.

The amounts of lime required per acre are very considerable, as an acre of soil to a depth of 12 inches weighs on an average about 3,500,000 lb. or 1,565 tons, and in order to add only $\frac{1}{10}$ **per cent. of lime** an application of 3,500 lb. or **31 cwt.** of **pure lime** (CaO) or **56 cwt.** of **pure lime carbonate** ($CaCo_3$) would be necessary.

If the lime is of poorer quality, containing impurities, increased amounts must be applied, as seen from the following small table :—

Amounts (in cwt.) of agricultural lime or burnt lime to be applied per acre.

To give Per Acre 12 in. deep	Agricultural Lime containing :—					
	% 60	% 80	% 100	—	—	$CaCO_3$
	or Burnt Lime containing :—					
	% 33·6	% 44·8	% 56	% 80	% 100	CaO
$\frac{1}{10}$ % CaO	96	70	56	39	31	Cwt.

Because lime must be applied in large amounts, its **cost** is of the greatest importance to the farmer. Hitherto quite extraordinary prices for lime of all sorts had to be paid in Queensland, and for this reason its use was greatly restricted.

The Department of Agriculture and Stock imported a **Jeffrey Lime Pulver**, a machine largely used by farmers in America for crushing limestone on their fields. The machine is at present at Gore and the Department can supply crushed limestone at 22s. 6d. per ton on the trucks.

This price is still high, but would undoubtedly be reduced as the operations are extended and the demand increases. It is not the intention of the department to keep the pulver at Gore, but rather to send the machine in turn to various districts, so that the farmers may form co-operative companies and work the lime in each locality under the Co-operative Agricultural Production Act, and may themselves crush the lime of deposits available in their neighbourhood in sufficient amounts for the demand of a few seasons. By this means the cost could be cut down to a minimum, as the work could be done by the farmers themselves, and particularly the cost for freight, by avoiding sending the crushed limestone over long distances, is reduced.

Prof. Cyril J. Hopkins, of the Agricultural Experiment Station at Illinois, U.S.A., the great advocate of the use of large quantities of crushed limestone and pulverised rock phosphate for the maintainance of permanent fertility, reports (1913) that ground limestone can be obtained at the cost of 60 cents a ton (1 dollar in bags) from the Southern Illinois Penitentiary, and at the cost of 50 cents to 1 dollar from twenty-nine different firms.

This price of **2s. to 4s. per ton,** according to quality and fineness, is extraordinarily low. At no place the lime costs the Illinois farmers, including all railway charges, more than **8s. per ton.**

Although the cost is so low, many farmers prefer crushing their own limestones, and five firms are selling machines suitable for this purpose.

In Victoria crushed limestone is sold at the quarries at 12s. 6d. to 15s. per ton in trucks.

Any farmer willing to experiment with liming the soil on his farm, pasture, or orchard, who purchases agricultural lime from the Department of Agriculture and Stock in quantities not less than 1 ton, should communicate with the Under Secretary of the Department, or the Director of Agriculture, or with one of the Instructors in agriculture or fruit culture in the various districts. As in such cases the analyses of the soil before and after liming are of particular educative value, such analyses of samples taken, under the direction of a Departmental officer, would be made free of charge, where approved experiments are so arranged. In this case careful record of the results of liming would have to be kept.

General Notes.

OPEN SEASON FOR OPOSSUMS AND BEARS.

Trappers and shooters of Opossums and Bears should note that the season for their operations this year commenced on 1st April, and will close on 30th September, 1919.

WANTED TO SELL, HIRE, OR EXCHANGE.

Have you an unused farm implement which you would exchange for, say, a cow? Your household has many unwanted articles—your neighbour likewise. To enable our readers to exchange these, we are opening an advertising column in the Journal. Send in a list of the articles you wish to exchange. Full particulars appear on page xx. of this issue.

SOCIETIES, SHOW DATES, ETC., 1919.

AYR.—Lower Burdekin Pastoral, Agricultural, and Industrial Association. Secretary, A. E. Dean. Annual Exhibition, 27th and 28th June.

BIGGENDEN.—Biggenden District Agricultural and Pastoral Society. Shaw dates: 26th and 27th June.

BOWEN.—The Bowen Pastoral, Agricultural, and Mining Association. Secretary, F. Sellars. Show dates: 19th and 20th June.

CHARLEVILLE.—Central Warrego Pastoral and Agricultural Association. Secretary, L. O. Easton. Show dates: 27th and 28th May.

CHARTERS TOWERS.—Towers Horticultural Society. Secretary, Jas. H. Chappel. Show dates 6th and 7th August.

DALBY.—Dalby Pastoral and Agricultural Association. Show dates: 29th and 30th April.

ELIMBAH.—Elimbah Farmers' Progress Association. Secretary, Chas. Rutter.

GAYNDAH.—The Gayndah Pastoral, Agricultural, Industrial, and Horticultural Association. Show dates: 1st, 2nd, and 3rd July.

KOONDAI-I (Bell).—Koondai-i Dairymen's Association. Secretary, Jas. Johnston.

MANLY.—Manly Fruitgrowers' Mutual Benefit Association. Secretary, J. Alcorn.

MAREEBA.—Mareeba District Mining, Pastoral, Agricultural, and Industrial Association. Secretary, P. H. O'Donnell. Show dates: 3rd and 4th June, 1916.

MOUNT MORGAN.—Mount Morgan Poultry and Kennel Club. Show dates: 5th and 6th June.

NAMBOUR.—The Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society. Show dates: 10th and 11th July.

NANANGO.—Nanango Horticultural, Pastoral, and Mining Society. Show dates: 30th April, 1st May.

OAKEY CREEK (*viâ* Eumundi).—Kenilworth Farmers' Association. Mr. A Hughes has been appointed Secretary, *vice* Mr. G. B. Sutton.

ROCKHAMPTON AGRICULTURAL SOCIETY.—19th, 20th, and 21st June.

ROCKLEA.—Rocklea Agricultural and Industrial Association. Secretary, A. Abercrombie. Show date: 27th September, 1919.

TOOGOOLAWAH.—Toogoolawah Pastoral and Industrial Association. Secretary, D. Young.

TOOWOOMBA.—Royal Agricultural Society of Queensland. Dates of Annual Exhibition, 6th, 7th, and 8th May, 1919.

WARWICK.—Eastern Downs Horticultural and Agricultural Association. Secretary, H. Sterne. Show dates: 11th, 12th, and 13th February.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1919.

Article.		MARCH. Prices.
Bacon	lb.	11½d.
Barley	bush.	4s. 2d. to 5s. 4d.
Bran	ton	£7 10s.
Broom Millet	"	£50 to £75
Broom Millet (Sydney price)	"	£75 to £82 10s.
Butter (First Grade)	cwt.	186s. 8d.
Chaff, Mixed	ton	£11 15s. to £13
Chaff, Oaten	"	£9 10s. to £10 10s.
Chaff, Lucerne	"	£14 to £14 15s.
Chaff, Wheaten	"	£8 10s. to £9 10s.
Cheese	lb.	1s. 0½d. to 1s. 1½d.
Flour	ton	£12
Hams	lb.	1s. 3d. to 1s. 4d.
Hay, Oaten	ton	...
Hay, Lucerne	"	£13 to £14
Hay, Wheaten	"	...
Honey	lb.	3d. to 6d.
Maize	bush.	7s. to 7s. 10d.
Oats (Seed)	"	5s. 6d.
Onions (Imported)	ton	£24 15s.
Peanuts	lb.	4d. to 6d.
Pollard	ton	£8 10s.
Potatoes	"	£15 10s. to £18 5s.
Potatoes (Sweet)	cwt.	5s. to 8s.
Pumpkins (Cattle)	ton	£20 10s.
Eggs	doz.	1s. 5d. to 2s. 1½d.
Fowls	per pair	2s. 9d. to 9s.
Ducks, English	"	2s. 10d. to 3s. 1d.
Ducks, Muscovy	"	3s. to 8s.
Geese	"	7s. to 8s. 5d.
Turkeys (Hens)	"	9s. 6d. to 11s.
Turkeys (Gobblers)	"	25s. to 30s.
Wheat (Milling)	bush.	5s. 9d.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	4s. to 12s. 6d.
Beetroot, per dozen bundles	1s. 3d. to 1s. 6d.
Cabbages, per dozen	7s. 6d. to 25s.
Carrots, per dozen bunches	1s. to 1s. 9d.
Cucumbers, per dozen	2s. 6d. to 4s.
Lettuce, per dozen	...
Marrows, per dozen	4s. to 11s.
Parsnips, per dozen bunches	1s. 3d. to 2s.
Peas, per sugar-bag	10s. to 15s.
Potatoes (Sweet), per cwt.	5s. to 8s.
Pumpkins (table), per cwt.	12s. to 24s.
Tomatoes, per quarter-case	3s. 6d. to 11s.

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Queensland), per case	8s. to 10s.
Bananas (Tweed River), per case	7s. to 21s.
Bananas (Fiji), per bunch	12s. to 14s.
Bananas (G.M.), per bunch	...
Bananas (G.M.), per case	8s. to 18s.
Lemons, per bushel-case	18s. to 24s.
Passion Fruit (Queensland), per case	18s. to 20s.
Pears, per case	4s. 6d. to 12s.
Pineapples (Queens), per double case	5s. to 9s.
Pineapples (Ripleys), per case	5s. to 9s.
Pineapples (Common), per case	5s.
Tomatoes, per half-case	5s. to 9s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	12s. to 20s.
Apples, Cooking, per bushel-case	7s. to 12s.
Bananas (Cavendish), per dozen	3d. to 6d.
Bananas (Sugar), per dozen	4d. to 5½d.
Citrons, per hundredweight	8s.
Cocoanuts, per sack	15s. to 25s.
Grapes, black, per lb.	6d. to 8d.
Grapes, white, per lb.	4d. to 6d.
Lemons (Lisbon), per case	20s. to 25s.
Mangoes, per bushel-case	3s. to 9s.
Passion Fruit, per quarter-case	8s. to 11s.
Peaches, per half bushel-case	4s. to 8s. 6d.
Peanuts, per lb.	4d. to 6d.
Pears, per quarter-case	12s. to 16s.
Persimmons, per quarter-case	4s. to 6s.
Piemelons, per hundredweight	3s. 6d.
Pineapples (Ripley), per dozen	1s. to 6s.
Pineapples (Rough), per dozen	1s. to 6s.
Pineapples (Smooth), per dozen	4s. to 5s. 6d.
Plums, per case	7s. to 11s.
Rockmelons, per dozen	4s. to 12s.
Sugar-melons, per dozen	5s. to 15s.
Tomatoes, per quarter-case (ripe)	8s. to 12s. 6d.
Tomatoes, per quarter-case (green)	2s. to 4s.

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1919.

Animal.	FEBRUARY. Prices.
Bullocks	£22 10s. to £25
Bullocks (Single)	£27 10s.
Cows	£12 5s. to £15 17s. 6d.
Merino Wethers	42s. 3d.
Crossbred Wethers	40s.
Merino Ewes	40s.
Crossbred Ewes	37s. 6d.
Lambs	34s. 6d.
Pigs (Porkers)	45s. 6d.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	January.		February.		March.		April.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·41	6·20	5·58	5·47
2	4·58	6·46	5·22	6·42	5·42	6·19	5·59	5·46
3	4·59	6·46	5·23	6·41	5·42	6·18	5·59	5·44
4	5 0	6·46	5·24	6·41	5·43	6·17	6·0	5·43
5	5·0	6·46	5·24	6·40	5·44	6·16	6·0	5·42
6	5·1	6·47	5 25	6·39	5·44	6·15	6·1	5·41
7	5·2	6·47	5·26	6·39	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·2	5·39
9	5·3	6·47	5·28	6·37	5·46	6·12	6·2	5·38
10	5·3	6·47	5·28	6·36	5·46	6·11	6·3	5·37
11	5·4	6·47	5·29	6·36	5·47	6·10	6·3	5·36
12	5·5	6·47	5 30	6·35	5·48	6·9	6·4	5·35
13	5·6	6·47	5 31	6·35	5·48	6·8	6·4	5·35
14	5·6	6·47	5·31	6·34	5·49	6·7	6·4	5·34
15	5·7	6·47	5·32	6·33	5·49	6·6	6·5	5·33
16	5·8	6·47	5·33	6·32	5·50	6·5	6·5	5·32
17	5·9	6·47	5·33	6·31	5·50	6·4	6·6	5·31
18	5·10	6·47	5·34	6·30	5·51	6·3	6 6	5·30
19	5·10	6·47	5·35	6·29	5·51	6·2	6·7	5·29
20	5·11	6·47	5·35	6·28	5·52	6·1	6·7	5·28
21	5·12	6·46	5·36	6·28	5·52	6·0	6·8	5·27
22	5·13	6·46	5·36	6·27	5·53	5·59	6·8	5·26
23	5·14	6·46	5·37	6·26	5·53	5·58	6·9	5·25
24	5·15	6·45	5·38	6·25	5·54	5·57	6·9	5·24
25	5·16	6·45	5·38	6·24	5 54	5·56	6·10	5·23
26	5·16	6·45	5·39	6·23	5·55	5·55	6·10	5·22
27	5·17	6·44	5·40	6·22	5·56	5·53	6·11	5·21
28	5·18	6·44	5·41	6·21	5·56	5·52	6·11	5·20
29	5·19	6·43	...	...	5·57	5·50	6·12	5·19
30	5·20	6·43	...	...	5·57	5·49	6·12	5·18
31	5·21	6·42	...	...	5·58	5·48	...	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.	
2	Jan.	New Moon	6	24	p.m.
9	,,	First Quarter	8	55	p.m.
16	,,	Full Moon	6	45	p.m.
24	,,	Last Quarter	2	22	p.m.

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

1	Feb.	New Moon	9	7	a.m.
8	,,	First Quarter	4	52	a.m.
15	,,	Full Moon	9	38	a.m.
23	,,	Last Quarter	11	48	a.m.

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

2	Mar.	New Moon	9	12	p.m.
9	,,	First Quarter	1	14	p.m.
17	,,	Full Moon	1	41	a.m.
25	,,	Last Quarter	6	34	a.m.

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11p.m.

1	April	New Moon	7	4	a.m.
7	,,	First Quarter	10	38	p.m.
15	,,	Full Moon	6	25	p.m.
23	,,	Last Quarter	9	21	p.m.
30	,,	New Moon	3	30	p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Farm and Garden Notes for May.

FIELD.—During this month, the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the department from the growers, to whom an advance of 1¾d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight, if the cotton is exported, will be deducted. Thus it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass, notably Rhodes grass, will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

In making asparagus beds, select the best soil in the garden. The most favourable is a deep, sandy loam, dug deep and well manured, a good sprinkling of salt being added to the surface a month or two before the planting season, that the rain and atmosphere may act upon it. Before planting, the ground should have another good dressing of well-rotted manure, be trenched again 2 feet to 2 feet 6 inches deep, and again be sprinkled with salt, leaving the surface neat and even.

During May or June mark out the beds 4 feet wide. Cut three trenches 6 inches deep which will complete each bed. In these, place the plants 15 inches asunder, spreading out the roots, and leaving the crowns 2 inches below the surface. Fill in the earth quickly. The object of making the beds so narrow is that they may not be trodden upon, as, from the length of time they remain without any further opportunity for deep digging, everything must be avoided which would tend to compress the earth.

For subsequent cultivation we refer our readers to articles on asparagus growing in this Journal, Vol. xxiv., April, 1910, and Vol. vi., New Series, July, 1916.

FLOWER GARDEN.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, and also soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice given respecting the handling and marketing of citrus fruits in the last two numbers of the Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this be done, there will be little fear of the fruit going bad in transit or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil; keep down undergrowth, and prevent the packing of the surface soil by tramping it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated, what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later, that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done, it will probably be moist enough for planting; but should there have been a dry spell, then, when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. If sound, free, sandy loams that are naturally scrub soils, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture; and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly-acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and, though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast Districts being equally applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, is recommended as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas phosphate, or fine bonedust, per acre. The crop to be ploughed in when in the flowering stage. The granite soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—BEEF AND DAIRY CATTLE.

The Office of the Secretary of the undermentioned Herd Book Societies is 303 Queen street, Brisbane:—

The Australian Hereford Herd Book;
The Shorthorn Herd Book of Queensland;
The Jersey Herd Book of Queensland;
The Illawarra Herd Book of Queensland;
The Ayrshire Herd Book of Queensland;
The Milking Shorthorn Herd Book of Queensland;
The Holstein-Friesian Herd Book of Australia.

NOTE.—Animals registered in the Commonwealth Standard Herd Book are not necessarily eligible for entry in the Jersey Herd Book of Queensland.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
DAIRY BREEDS.				
AYRSHIRES.				
L. H. Paten	"Jeyendel," Calvert, S. & W. Line	8	21	Ayrshire Herd Book of Queensland
J. H. Paten	Gwandalan, Yandina	6	21	Do.
Queensland Agricultural College	Gatton	4	10	Do.
State Farm	Warren	3	83	Do.
J. W. Paten	Ayrshire Park, Wanora, Ipswich	10	42	Do.
J. H. Fairfax	Marinya, Cambooya	9	55	Do.
J. Holmes	"Longlands," Pittsworth	6	20	Do.
H. M. Hart	Glen Heath, Yalangur	7	21	Do.
F. A. Stimpson ..	Ayrshire Stud, Fairfield, South Brisbane	7	77	Do.
M. L. Cochrane ..	Paringa Farm, near Cairns	5	21	Do.
John Anderson ..	"Fairview," Southbrook	7	34	Do.
JERSEYS.				
T. Mullen	"Norwood," Chelmer	3	20	Jersey Herd Book of Queensland
Queensland Agricultural College	Gatton	2	31	Do.
M. W. Doyle	"Oaklands," Moggill	4	12	Do.
G. A. Buss	Bundaberg	1	15	Do.
R. Conochie	Brooklands, Tingoora	9	21	Do.
W. J. Barnes	Millstream Jersey Herd, Cedar Grove	10	37	Do.
W. J. Affleck	Grasmere, N. Pine ..	6	31	Do.
J. N. Waugh and Son	Prairie Lawn, Nobby	3	28	Do.
W. J. H. Austin ..	Hadleigh Jersey Herd, Boonah	2	11	Do.
State Farm, Kairi ..	Kairi, *viâ* Cairns ..	4	16	Do.
H. D. B. Cox	Sydney (entered in brother's name)	3	16	Commonwealth Standard Jersey Herd Book
GUERNSEYS.				
Queensland Agricultural College	Gatton	2	2	Eligible, but no Guernsey Herd Book of Australia

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—*continued.*

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
DAIRY BREEDS—*continued.*				
HOLSTEINS.				
Queensland Agricultural College	Gatton	2	9	Holstein-Friesian Herd Book of Australia
George Newman ..	"St. Athan," Wyreema	12	47	Do.
F. G. C. Gratton ..	"Fowlerton," Kingsthorpe	1	15	Do.
R. S. Alexander ..	Glenlomond Farm, Coolumboola	1	3	Do.
Ditto	Ditto	1	..	Holstein-Friesian Herd Book of New Zealand
S. H. Hoskings ..	St. Gwithian, Toogooloowah	..	..	Holstein-Friesian Herd Book of Australia
C. Behrendorff ..	Inavale Stud Farm, Bunjgurgen, Q.	3	9	Do.
E. Swayne	West Plane Creek, Mackay	1	2	Do.
ILLAWARRA.				
A. Pickels	Blacklands Stud, Wondai	4	62	Illawarra Herd Book of Queensland
J. T. Perrett and Son	Corndale, Coolabunia	3	43	Do.
W. T. Savage	Ramsay	2	22	Do.
Hunt Bros.	Springdale, Maleny ..	3	62	Do.
MILKING SHORTHORNS.				
P. Young	Talgai West, Ellinthorp	2	42	Milking Shorthorn Herd Book of Queensland
W. Rudd	Christmas Creek, Beaudesert	2	10	Do.
A. Rodgers	Torran's Vale, Lanefield	1	9	Do.
W. Middleton	Devon Court, Crow's Nest	3	27	Do.
A. K. Yorksten ..	"Dunure," Miles ..	2	8	Do.
BEEF BREEDS.				
SHORTHORNS.				
T. B. Murray-Prior ..	Maroon, Boonah ..	2	37	Queensland Shorthorn and Australian Herd Books
C. E. McDougall ..	Lyndhurst Stud, Warwick (2)	25	100	Queensland Shorthorn Herd Book
Godfrey Morgan ..	"Arubial," Condamine	3	6	Do.
W. B. Slade	E. Glengallan, Warwick	2	20	Do.
HEREFORD.				
A. J. McConnell ..	Dugandan, Boonah	19	36	Australian Hereford Herd Book
E. M. Lumley Hill ..	Bellevue House, Bellevue	45	127	Do.
Tindal and Son ..	Gunyan, Inglewood	50	400	Do.
SUSSEX.				
James T. Turner ..	The Holmwood, Neurum	2	4	Sussex Herd Book of England

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Agriculture.

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS—No. 4.

By P. MAHONEY, Cooper's Plains.

Quantity of Water to Use.

Irrigation, like other occupations, needs knowledge and judgment to meet with the best results. The essential means for success do not depend entirely upon water and good soil. Both these essentials might predominate, and yet failure is liable to be met with. The art of knowing how much, and when to apply the water, is most important, for too much water is as disastrous as too little. Water applied unnecessarily does not produce as good a result as when given at the right time. It is not necessary to have the ground always sodden in order to produce payable crops. Once the plant or crop becomes stunted for the want of water it cannot be recuperated by superfluous waterings, nor produce good results.

In establishing orchards, &c., great care should be exercised in seeing that only the necessary amount of water is supplied, for if the surface soil is always kept wet, the plant will produce shallow roots, which will, when the plant is in full bearing, take an enormous amount of water to keep it supplied with enough nourishment to mature the crop, especially through dry and hot weather. This can all be avoided by supplying only the required quantity when the plant is young, thus encouraging the plant to send roots downwards in search of moisture. In fact, it is good policy to force them to go down so that they will not be affected by the rays of the scorching sun on the surface soil during the summer months. When such precautions are taken in irrigating, the plants are much more liable to produce satisfactory crops, and are affected in a less degree by adverse weather conditions.

The over-watering of fodder crops is disastrous, for these become detrimental to stock in several ways. They scour the beast dreadfully. Chaff which is produced under irrigation, unless the crop (more especially lucerne) has been cautiously watered, is dangerous, and it is not wise to feed it to a valuable animal if it has been produced under such conditions, *i.e.*, subjected to superfluous waterings, for such chaff is likely to produce much more dust than ordinary chaff, which through inhalation rests on their lungs and sometimes kills horses, but more often ruins them and so causing them to become short-winded. Enormous hay and grain crops are obtained on the River Murray flats (S.A.) after the flood waters subside, but such hay has proved to be dangerous, as it scours the beasts to utter weakness. Yet the heaviest crop (Lifter oats) that has been attained in the southern hemisphere has been grown under these conditions, which proves that quantity alone should not be the aim of the irrigator in the case of fodders, fruits, &c. Fruits which are grown under similar circumstances will not stand packing very well, and are bad shippers.

Lucerne hay which has been over-watered dries out brittle; consequently, during curing, it loses an enormous quantity of flag, much impairing the quality of the chaff.

(*To be continued.*)

COTTON SEED FOR DISTRIBUTION.

That the cotton-growing industry is steadily increasing in Queensland since the Department of Agriculture undertook to assist intending growers by establishing a ginning plant in Brisbane, making a cash advance to farmers on all seed-cotton delivered at the ginnery, and undertaking, furthermore, to market the fibre on the owners' account, deducting only the actual cost of ginning, baling, and cartage, is apparent from the annual returns of cotton production since 1914, whilst the price paid to farmers for their seed-cotton has regularly risen, reaching, in 1918, a figure which amply repays them for their enterprise.

This is clearly shown by the Under Secretary for Agriculture in his last annual report in the following:—

COMPARATIVE STATEMENT OF COTTON CROPS, 1914-1918.

Year.	Total Received.	Lint.	Advance per Lb.	Price Paid for Lint per Lb.	Price Received by Farmers per Lb. of Raw Cotton.
	Lb.	Lb.	*d.*	*s. d.*	*d.*
1914	9,455	2,794	1½	0 6	1·65
1915-16	29,230	10,066	1¾	0 6·9	2·54
1917	118,229	37,694	1¾	0 11	3·5807
1918	166,458	54,280	2	1 1	4

The above figures show that the crop for 1918 amounted to eighteen times that of 1914. Should the area under this crop continue to thus largely extend, there will be, as heretofore, no difficulty in disposing, in Australia alone, of all the cotton which Queensland may produce for a long time to come, at a satisfactory price, judging by the keen competition of local and Southern buyers for the past crops.

To ensure the production of first-class cotton, free from disease or insect pests, the Department purchased a quantity of seed of the best varieties of Uplands cottons in the United States of America. This seed has been supplied gratis to intending growers, and the result has been that, independent of the good returns from this seed, no further importations will be needed.

For the coming season there is a good supply of guaranteed seed for distribution, and, as the best time for sowing in the South is from the latter end of August to October, applications for a supply of seed, stating the area intended to be planted, should be sent early to the Department. (*See* advertisement on page xviii., "Q.A.J.")

November is rather late for planting in Southern Queensland, but full crops have been gathered from November sowings in districts where frosts only occur late in June or July. The Department supplies seed at the rate of 10 lb. per acre, which is more than ample to allow for ungerminated seed and misses. Full information on the subject of the cultivation of the plant may be obtained from the Department. Applications for seed to be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

PINEAPPLE CIDER.

Mr. R. W. Holloway, West Cairns, writes on this subject:—

"A few months ago I noticed in your paper that you would be pleased to receive suggestions, &c., from any of your readers that might be deemed useful or interesting, and so I was tempted to send you the following:—

"There are doubtless many people who from time to time have a surplus of pineapples which they do not know what to do with, and it occurred to me: 'Why not make pineapple cider?' I would point out this fact, that it realises 1s. 6d. per bottle in England, and the demand far exceeds the supply; in fact, it is seldom to be obtained, and what little there is comes from the West Indies (Jamaica, I believe). Apple cider only sells at from 4d. to 6d. per bottle, and at this price one would think it can scarcely pay to produce. The same kind of apparatus, such as the press, mats, fruit-slicing machine, &c., would do for either pines or apples, and if the manufacture were carried out on a fairly large scale it should pay well.

"The usual plan in England is for each farmer to hire the necessary paraphernalia for a few days, and pass it on to his neighbour. No doubt some of your readers will be fully cognisant of the details as practised in Somerset, Dorset, and Wiltshire."

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1919.

The following are the final scores for the 1918-19 competition, which ended on 31st March. A full report will be published later. The prizes were awarded as follows:—

LIGHT BREEDS.

General aggregate	G. W. Hindes	1st
	T. Fanning	2nd
	W. Becker	3rd
True to type aggregate	G. Hindes	1st
	T. Fanning	2nd
	W. Becker	3rd
Winter test	G. W. Hindes	1st
	G. Howard	2nd
	C. Knoblauch	3rd
Single test	G. W. Hindes	1st
	Dr. Jennings	2nd
	G. W. Hindes	3rd

HEAVY BREEDS.

General aggregate	R Burns	1st
	W. Smith	2nd
	J. W. Macrae	3rd
True to type aggregate	R. Burns	1st
	W. Smith	2nd
	J. W. Macrae	3rd
Winter test	W. Smith	1st
	J. W. Macrae	2nd
	R. Burns	3rd
Single test	R. Burns	1st
	D. Fulton	2nd
	E. F. Dennis	3rd

In many cases individual birds and groups have put up scores higher than those of the winners, but as the eggs laid were below the standard required, viz., 24 oz. per dozen, they are ineligible for prizes. As this seems to affect so many of the highest layers, it would seem that breeders in their desire to obtain numbers are neglecting quality. It will be noted that Mr. W. Smith has been awarded prizes, although in the August report his average was given as under 2 oz. This average was based on the weight of eggs of four birds only, as two were not then laying. The eggs of these have been since weighed, and found to be full weight and over. The following are the individual records:—

Competitors.	Breed.	March.	Total.
LIGHT BREEDS.			
*Dixie Egg Plant	White Leghorns ...	98	1,573
*G. W. Hindes	Do.	119	1,526
*E. Chester	Do.	60	1,433
*T. Fanning	Do.	81	1,428
*W. Becker	Do.	94	1,386
*Mrs. L. Henderson	Do.	81	1,351
*W. Lyell	Do.	80	1,348
*Geo. Prince	Do.	82	1,347
*G. Howard	Do.	89	1,343
*C. P. Buchanan	Do.	59	1,343
*G. H. Turner	Do.	65	1,314
*E. A. Smith	Do.	75	1,310

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	March.	Total.
LIGHT BREEDS—*continued.*			
*Dr. E. C. Jennings	White Leghorns ...	67	1,304
*C. Knoblauch	Do.	89	1,282
*L. G. Innes	Do.	40	1,261
*Range Poultry Farm	Do.	67	1,254
*R. Holmes	Do.	63	1,250
*Quinn's Post Poultry Farm	Do.	72	1,245
*Thos. Taylor	Do.	82	1,245
*Oakland Poultry Farm	Do.	45	1,241
Mrs. L. F. Anderson	Do.	90	1,230
*O.K. Poultry Yards	Do.	54	1,196
*Mrs. A. T. Coomber	Do.	60	1,191
B. Caswell	Do.	62	1,188
H. Fraser	Do.	69	1,179
*Mrs. R. Hunter	Do.	80	1,178
J. J. Davies	Do.	59	1,176
*J. M. Manson	Do.	56	1,174
Geo. Trapp	Do.	92	1,157
*Homalayan Poultry Farm	Do.	33	1,140
*J. Zahl	Do.	80	1,126
Mrs. A. G. Kurth	Do.	52	1,111
H. B. Stephens	Do.	49	1,059
*C. Porter	Do.	52	1,058
Progressive Poultry Pens	Do.	74	1,055
S. Wilkinson	Do.	76	1,052
O. W. J. Whitman	Do.	47	1,040
B. Chester	Do.	81	1,041
Shaw and Stevenson	Black Leghorns	61	1,040
*T. B. Hawkins	White Leghorns ...	39	1,028
W. A. Wilson	Do.	80	1,010
H. F. Britten	Do.	61	1,009
G. Williams	Do.	56	994
*J. W. Newton	Do.	80	988
P. O. Oldham	Do.	34	980
R. T. G. Carey	Do.	47	936
A. W. Walker	Do.	58	936
HEAVY BREEDS.			
*Nobby Poultry Farm	Black Orpingtons ...	80	1,389
*D. Fulton	Do.	114	1,364
*R. Burns	Do.	80	1,283
*E. Morris	Do.	105	1,263
*Mars Poultry Farm	Do.	96	1,225
*A. E. Walters	Do.	72	1,220
*E. F. Dennis	Do.	86	1,218
W. H. Reilly	Chinese Langshans ...	99	1,199
*W. Smith	Black Orpingtons ...	106	1,195
T. Hindley	Do.	59	1,172
A. Shanks	Do.	79	1,141
E. M. Larsen	Do.	36	1,086
J. W. Macrae	Do.	41	1,058
T. W. Lutze	Do.	86	1,031
*F. A. Claussen	Rhode Island Reds ...	48	875
H. Puff	Do.	56	819
J. Fitzpatrick	Do.	44	818
W. J. Mee	Black Orpingtons ...	50	809
Totals	...	4,447	76,243

* Indicates that the pen is engaged in the single hen test

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	235	249	303	229	257	298	1,573
G. W. Hindes	292	244	237	262	253	238	1,526
E. Chester	261	220	232	259	245	216	1,433
T. Fanning	251	221	254	198	253	256	1,428
W. Becker	233	242	214	251	208	238	1,386
Mrs. Henderson	234	194	232	193	272	226	1,351
W. Lyell	222	241	243	212	220	210	1,348
Geo. Prince	207	249	205	245	221	220	1,347
G. Howard	220	212	238	257	198	218	1,348
C. P. Buchanan	195	223	242	224	222	236	1,342
G. H. Turner	168	147	259	228	297	220	1,314
E. A. Smith	211	253	198	221	222	205	1,310
Dr. Jennings	180	277	234	187	226	190	1,304
C. Knoblauch	239	210	232	202	178	221	1,282
L. G. Innes	220	224	302	132	154	229	1,261
Range Poultry Farm	167	241	194	227	219	206	1,254
R. Holmes	209	235	205	209	191	201	1,250
Quinn's Post Poultry Farm ...	259	207	192	142	241	204	1,245
Thos. Taylor	147	238	211	203	220	226	1,245
Oakland Poultry Farm	180	215	223	215	227	181	1,241
O.K. Poultry Yards	185	236	205	191	222	177	1,196
Mrs. Coomber	187	205	207	207	162	223	1,191
Mrs. R. Hunter	178	200	149	204	229	218	1,178
J. M. Manson	246	309	238	186	142	153	1,174
Homalayan Poultry Farm ...	228	184	184	146	210	188	1,140
J. Zahl	231	183	213	211	172	116	1,126
C. Porter	158	192	186	182	110	220	1,058
T. B. Hawkins	211	145	191	152	148	187	1,028
J. W. Newton	190	220	129	138	189	132	988
HEAVY BREEDS.							
Nobby Poultry Farm	281	240	224	130	260	254	1,389
D. Fulton	290	199	207	212	185	271	1,364
R. Burns	190	218	186	202	275	212	1,283
E. Morris	190	202	227	252	216	186	1,263
Mars Poultry Farm	215	223	198	205	184	200	1,225
A. E. Walters	179	222	159	231	220	209	1,220
E. F. Dennis	249	193	192	134	228	222	1,218
W. H. Reilly	197	215	219	178	170	220	1,199
W. Smith	266	198	164	193	167	207	1,195
J. W. Macrae	124	154	192	182	110	195	1,058
F. A. Claussen	151	151	164	146	148	115	875

FINAL REPORT OF THE FIFTEENTH EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE.

The fifteenth egg-laying competition at the Queensland Agricultural College was concluded on the 31st of March, 1919. In all, 390 birds competed—150 in group pens, while the balance of 240 were single tested.

WEATHER CONDITIONS.

More unfavourable weather could not have been experienced. The drought that prevailed throughout the competition was most trying to the birds, both as regards their health and the supply of necessary feed stuffs, which latter were often unprocurable owing to the hot, dry times.

FEEDING.

The morning mash used throughout the contest was the same as that fed in former years, viz.—60 per cent. pollard, 30 per cent. bran, 5 per cent. Meggitt's linseed meal, and 3 to 7 per cent. dried blood. The above figures are about standard, but slight alterations were made when the quality of the mill offal varied. Altogether the quality of the foodstuffs has not been satisfactory. Sound wheat, the appearance of which has almost been forgotten, has been unprocurable, and, in its absence, the most had to be made out of cleaned weevil-eaten grain. The absence of green feed has been severely felt by the birds, very little of this important food being procurable.

GENERAL RESULTS.

Taking into consideration the set-backs that the birds have had to experience, some of the results are remarkable. Throughout the year it has been nothing else but the survival of the fittest, and the general results point to the good stamina the birds must have possessed to carry on as they did. Whilst the contest was actually proceeding, it was necessary, owing to the transfer of the College poultry plant, to remove 270 of the competing birds, making set-back number one, and a big one at that, for it is the best proven method of checking laying. Some were moved at a critical time, when there was every possibility of moulting owing to the check. The second check was the absence of green feed. The want of this important food in a good season would have had a depressing effect, but being withheld in a dry time like the 1918-19 year, it is easily understood that the birds experienced a trying time, and that it was a matter of difficulty to keep them in good health. In view of this the results obtained are highly satisfactory and indicate that the majority of the birds possessed first-class stamina and quality. Some few pens—and it is pleasing to note there were not many of this class—did badly, but these would have been inferior no matter what conditions they had been kept under.

RECORDS.

It is to be regretted that many fine performances were negatived by light weight eggs. Individual birds and several groups did excellently as regards number of eggs laid, but as the weight of egg was below the 2 oz. standard required, these birds and pens were ineligible for prizes, nor could they carry away with them the seal ring of performance. This failure to attain the required weight was especially noticeable among the Black Orpingtons. Among the light breeds, the performance of Mr. G. W. Hindes's pen "I" (the winner of the Light Breed competition) is to be highly commended. All who visited the pens agreed that this was the most typical pen in the competition, and they gained pride of place in the matter of trueness to type. But besides this, five out of the six birds laid eggs up to or above the standard. Further, each of the birds laid well, three passing the 250-egg mark, and the other three were close up. The uniformity of this pen, coupled with the high production and high quality, is a truly fine achievement for one breeder's yard. The pen of White Leghorns entered by the

Dixie Egg Plant deserves special comment. This pen laid a total of 579 eggs for the winter test, a world's record as regards numbers. Further, this pen laid the highest aggregate for the year, and each of the six birds was a consistent egg-producer. Unfortunately for such a successful breeder, not one of these birds laid eggs weighing up to the standard required. Three birds laid 300 eggs and over, viz.—Dixie Egg Plant's "C" bird (303) and "F" (300), and L. G. Innes's "C" bird (302). In these three cases the eggs were under weight, so that Mr. Hindes's "A" bird, with 292 to her credit, was awarded the prize for the highest individual score. As a case of continuance in laying, D. Fulton's "A" bird deserves mention. She laid 3 eggs in 4 days at the beginning of April, 1918, and then went off until the 5th of June, but since then has put up the remarkable score of 287 eggs in 301 days, putting up two big breaks of 70 from 20th July to 27th September, and 77 from 29th September to 14th December.

Broodiness.

The number of broodies was not so large as in the preceding contest, although they were still plentiful. Very few cases were recorded in the Light Section. In the Heavy Section birds owned by the following breeders were very free from broodiness (in most cases only one bird in each of the respective pens giving trouble) :—Nobby Poultry Farm, R. Burns, T. Hindley, A. Shanks, D. Fulton.

Group Pens.

One cannot help remarking upon the disadvantage of the group when compared with the single test system. Besides the fact that the latter gives the record of each bird, it is found that more judgment can be used in the feeding, as with groups there are always one or two shy feeders and odd gluttons in the pen, and although the feeding may be gone over twice, it is not satisfactory. Under the system of housing, as adopted at the College, whereby no scratching material is given, the birds in the single pens appear to tire of their own company and seem to move about more than those in the groups. This is of great benefit to them. If a bird in a single pen appears to be too high in condition, her allowance can be regulated; but in a group pen a bird inclined to go to condition has to receive all she will eat, or the remainder are deprived of a fair feed.

Health of Stock.

Taking all things into consideration, the health of the birds has been good. In all there were twenty-six deaths. There were two cases of tuberculosis, six cases of ruptured internal organs, twisted bowels, broken blood vessels, or ovarian cases; two accidental deaths caused by a wind storm; while the remaining sixteen were due either to liver trouble, wasting, or going light, bowel and blood troubles, or inflammation of lungs. Towards the end of January the absence of greenstuff made itself very apparent, paleness of comb, poor feeding, and unhealthy droppings being very plentiful. A purge would have been of great assistance to those ailing, but to have given this generally throughout

the flock would have brought on a number of moults, which would have been undesirable. Thus, to combat the trouble, ailing birds had to receive individual treatment, and as far as possible this was carried out. Certainly some of the cases of sickness were due to weak stamina, and the chances of several of the pens were spoiled by their containing one or more birds of a bad constitution. But in a majority of cases illness was due to a shortage of greenstuff, thus withholding Nature's most effective blood and bowel rectifier. Under these circumstances, all birds which have been ill should not be condemned for breeding. However sound it may be, under normal conditions, to follow the practice of never breeding from a bird which has been ill, this seems scarcely just in the case of such an abnormal season as that of 1918-19.

GENERAL COMMENTS ON "TRUENESS TO TYPE," COMPETITION BIRDS.

Light Breeds.—The improvement in type of the birds competing in the current competition is small in comparison with the 1917-18 contest. In classifying the pens, the standard of the utility poultry breeders has not been strictly adhered to, and a good deal of leniency has been shown in connection with the English Poultry Club standards. There are a few pens of exceptional quality, and it is very gratifying to be able to say that these same pens have, in nearly every instance, given a satisfactory account of themselves. The type of the birds in the six-hen test, which are for the most part owned by beginners in competition work, is much better than the type of those owned by the majority of the old hands, and new men in the singles have in most cases forwarded good specimens. In our opinion, the pen owned by G. W. Hindes is almost ideal for utility work, and possesses every feature that marks them as Leghorns. They have size without coarseness, are very uniform, with typical Leghorn bodies, and perfect headpieces. They also possess stamina which no change in weather or conditions seems to shake. This, in our opinion, is half the battle in competition work. This same pen has passed the weight of egg test, and takes the third place for number of eggs produced. It is, therefore, plainly proved that close conformity to the English standard weight and number of eggs can be obtained by some breeders. It is therefore intended to adopt more stringent measures each year, allowing ample time for competitors to make the necessary improvements in their stock. The lack of uniformity in some of the pens spoils their whole appearance. Several pens are completely spoilt, and consequently graded lower, owing to one or two individuals being dwarfed. The Homalayan P. Farm's F bird in the single test is about the most typical bird in the competition, yet the pen is graded second class owing to the absence of uniformity. There are a goodly number of Leghorns with very diminutive combs. Taken for granted that the comb calls for a certain amount of upkeep, the larger it is the bigger the drain on the bird's system, a Leghorn without the neatly serrated, fine-textured comb hanging gracefully on one side has the appearance of anything other than a Leghorn, especially if the medium comb is in conjunction with small size or discoloured lobes. Tail-carriage in Leghorns has a tendency to alter the general outline of a bird. One possessing a "squirrel" tail usually carries its body more erect than one with the tail at an angle of 45 degrees to the back. These high-tailed, upright carriage birds always appear to be short backed, and always have an erect or semi-erect comb and rather long shanks. During the six months' duration of the present competition the weather has been most variable, and at times only birds possessing stamina could show a satisfactory advance in their totals. Owing to the judgment for trueness to type having been postponed till half the contest was finished, we are placed in a favourable position to observe the doings of the pens during trying weather conditions. There are, in our opinion, certain pens which their owners have had difficulties in rearing, and others that show every evidence of having been troubled with roup, catarrh, and other sickness in their early life. It is very often the case that a breeder has trouble with his young chickens, and at times has to treat them for various ailments; but as soon as these same birds redden up for laying and have that beautiful appearance that a pullet has when about to lay, in a large number of cases the owner forgets the bird's past life, thinks only of how she appears at the time for sending for competition work, and the way she was bred. These birds which have had early set-backs are soon picked out when the genuine hard work comes or the weather is trying. Some continue to lay moderately, but their drawn-in faces, anaemic combs, shrunken legs, overloaded tail appearance, poor appetites, and forlorn look give them away when the subject of stamina comes in. Stamina has had a great deal to do with the manner in which the birds are graded, for without it they cannot stand a year's heavy laying, and then be

expected to produce birds even better than themselves. Competitors who think they have been hardly dealt with in the classification can rest assured that one of the reasons for their being graded lower than their expectations is that the birds owned by them are showing the strain in too marked a degree. Owing to the scarcity of green feed, closely bred birds feel its absence and show it in their returns. The very hot weather, together with the absence of greenstuff, picks out and hastens the death of a number of birds possessing hereditary weaknesses and disease. It would be far better for a breeder to sacrifice a dozen or two eggs than to put up with the trouble and disappointment of rearing the present day usual run of weak constitutioned specimens. The heavy mortality in rearing is often the cause of the disheartening of a beginner.

Heavy Breeds.—We have gone to the expense of leniency in classifying the heavy breeds, which for the most part consist of Black Orpingtons. Not only have breeders to make a big improvement in type, but the size of the eggs and tendency to broodiness have to be amended. There is a very great variety of type amongst the Orpingtons. There are birds with short backs, roach backs, finny backs, and those with cushions resembling those of a present-day Cochin. These backs finish off with an assorted variety of tails. There are true Orpington tails, long tails, and spread tails. Breeders of exhibition Orpingtons know too well the difficulty of producing blacks with that much desired green sheen, so too strict attention has not been given to this feature when passing verdict in this section. The required points of an Orpington are much harder to obtain than those of a Leghorn; hence, as previously remarked, more leniency has been shown in classifying in this breed. Side spikes on single combs are in evidence in too many cases for one's liking: it is a defect which is transmitted. Birds having this fault will be placed in the 4th class in future competitions, and the same may be said of birds having feathers on their shanks in the clean-legged breeds. The combs on some of the Black Orpingtons are too large and hang to one side, so that if they possessed white lobes they would easily pass for a light breed. The build of some, with their long backs, tails, and legs, together with their fineness of bone, more resembles a light breed than a heavy one. The sooner the better it will be for all utility poultrymen when a thorough understanding is arrived at as to what constitutes the type, and the number of points to be allotted for each feature in all breeds for utility purposes, instead of one common standard as issued by the Utility Poultry Club. The severe task of classifying 400 birds, the majority of which possess any number from three to a dozen failings on comparing them with the original standard, is a task not to be envied. Often the remark is heard—"That's So-and-so's type of birds." It may mean that So-and-so's stock compare with the standard so favourably that they stand out from all others; or, on the other hand, that he has been adopting close breeding and has stamped a number of failings into his flock which are easily detected. Shape is half the breed, and features the other half. The writer of these notes once showed a Jubilee Orpington, rather long in back, as a Speckled Sussex in one of the leading young stock shows of England, and won first prize. The same bird won first and cup at the Crystal Palace in the Jubilee Orpington class, thus showing that too much was allowed for colour and not sufficient for shape. The evolution of the Orpington has been remarkable. The late Wm. Cook originated the breed, for one reason, for lovers of the Cochin who objected to the feathering on the legs; but it must be borne in mind that the Cochin of that date was not the mass of balls of fluff it is at the present day. The first Black Orpington that was shown was very clean in face, possessed good eyes, but was not the full-fronted bird of the present day. It possessed width, fair length of back, a moderate tail, and showed more daylight underneath than the show bird of to-day, which has the appearance of being related to the old Scotch Dumpie. In fact, the old time B.O. had the appearance of a robust, rather close feathered, better class utility Black of the present time.

The classification of the competing pens is as follows:—

Class I.—Have passed, having answered all requirements in trueness to type.

Class II.—Have passed, but have faults which need rectifying in future breeding. These faults will be found in the full detailed report given below.

Class III.—Possess faults which will pass them out in the next competition (1919-20), and the breeders must take drastic measures to improve same, otherwise they will not be accepted for future competition. This current competition will admit this class.

Class IV.—Altogether failing to comply with our requirements and consequently passed out.

Detailed Comments on Light Section.

G. W. Hindes (Class I.).—Nearest our ideal in the competition.
O.K.P. Farm (Class IV.).—B, D, and E too small. F side spikes.
Range P. Farm (Class II.).—Strong constitutions, variation in tail carriage.

L. G. Innes (Class II.).—Devoid of Leghorn headpieces, only just managed to get into this class.

Geo. Prince (Class III.).—B inclined to be wry-tailed.

C. Knoblauch (Class III.).—Lacking in stamina.

Oakland P. Farm (Class III.).—Tail carriage variable, assorted sizes and headpieces.

E. A. Smith (Class II.).—Lack uniformity, strong constitutions.

Geo. Howard (Class I.).—F a trifle small, good constitutions, D one of the most typical in competition.

T. Fanning (Class I.).—Robust, good doers, possessing size, and Leghorn characteristics, F a really fine specimen.

W. Lyell (Class II.).—An even, business-like pen, but could do with more size.

Dr. E. C. Jennings (Class IV.).—D and F very small, spoiling pen altogether, too high tail carriage and tails too erect, A, B, and C good bodies.

R. Holmes (Class II.).—Rather narrow, could do with more room behind in some cases, splendid open faces and fine textured combs.

T. B. Hawkins (Class II.).—C bird appears on the weak side.

G. H. Turner (Class III.).—C and E too small, E white in face, pen lacks uniformity.

Mrs. L. Henderson (Class I.).—Good bodies and tail carriage, neat heads.

Homalayan P. Farm (Class II.).—Very variable, B inclined to be weak, F bird an ideal specimen.

C. Porter (Class III.).—Splendid bodies, but all white in face.

C. P. Buchanan (Class II.).—Rather on fine side, but strong, good doers.

J. W. Newton (Class II.).—Largest in competition, too coarse in cases; headpieces away from requirements, being too large in some and rough textured in others.

Dixie Egg Plant (Class II.).—Not of the largest, D and E possess neat heads, the others having very small combs, rather fine in type, faults largely counteracted by stamina.

J. Zahl (Class IV.).—Lacking in stamina.

Mrs. R. Hunter (Class II.).—Heads trifle coarse; good size, shape, and bone; A and E have side spikes on comb.

W. Becker (Class III.).—Squirrel-tailed, C wry-tailed, combs too erect, only just managed this class.

E. Chester (Class III.).—Side spikes in evidence, lack size and substance, splendid constitutions.

Quinn's Post P. Farm (Class II.).—B bird too fine in bone, good bodies; F erect comb.

Mrs. A. T. Coomber (Class II.).—Size varies, C spoils pen, F very typical.

Thos. Taylor (Class II.).—B bird too fine, otherwise first-class pen.

J. M. Manson (Class II.).—Could be more uniform.

H. F. Britten (Class I.).—A very nice light-feathered pen, showing no weediness whatever.

G. Williams (Class II.).—On the narrow side and not too uniform.

A. W. Walker (Class I.).—A pen we like very much, being very typical and good doers, evidently were used to intensive housing before arrival at competition.

H. Fraser (Class III.).—Very mixed.

W. A. Wilson (Class II.).—One small bird spoils pen.

S. Wilkinson (Class IV.).—Too small and type very variable.

Mrs. L. F. Anderson (Class II.).—Lack uniformity.

E. Chester (Class II.).—Spoilt by variation in size.

Geo. Trapp (Class I.).—Splendid bodies and carriage.

R. T. G. Carey (Class IV.).—Type and size very uneven.

O. W. J. Whitman (Class III.).—Lacking in Stamina.

B. Caswell (Class I.).—Very even and good stamina, want just a little more size.

P. Oldham (Class I.).—Nice headpieces, slight variation in size, good bodies.

J. J. Davies (Class I.).—Good doers, a pleasing pen all through.

Shaw and Stevenson (Class I.).—A first-class pen for type, size, and colour. Constitutions good.

Mrs. A. G. Kurth (Class II.).—Rather coarse in heads, good bodies and stamina.

Progressive P. Pens (Class I.).—A front rank pen for size and shape. Another pen that has evidently been used to intensive work before entering competition.

Heavy Breeds.

J. W. Macrae (Class II.).—Good size, plenty of room, too much tail.

W. Smith (Class I.).—Nice and blocky, type of the best if compared with average utility Blacks of the present day.

F. A. Claussen (Class I.).—Good size and shape, colour passable on arrival in April, 1918.

D. Fulton (Class II.).—Type not consistent throughout, splendid eyes.

Nobby P. Farm (Class II.).—Very strong constitutions, roach backs and too tall on legs.

R. Burns (Class III.).—A big variation throughout in type and size.

E. Morris (Class III.).—Type not regular enough, those possessing shape are too small.

A. E. Walters (Class I.).—A very nice pen, taken all round, not so tall as the majority, headpieces very neat.

Mars P. Farm (Class II.).—Very neat heads, inclined to too much tail.

E. F. Dennis (Class IV.).—Type very variable, poor colour.

W. H. Reilly (Class II.).—Type and size not consistent, type of D bird approaching that of a modern Langshan.

E. M. Larsen (Class II.).—Good constitutions, and not so tall as a good many; could be more uniform.

J. Fitzpatrick (Class I.).—Good size and stamina, not the best of colour.

T. Hindley (Class II.).—First-class headpieces, too much tail, colour in some cases dull and devoid of sheen.

H. Puff (Class I.).—The pick of the R. I. Red pens; two birds in this pen are fit for show bench.

W. J. Mee (Class IV.).—Too small, and altogether away from standard.

A. Shanks (Class I.).—One of the best pens in the heavy section for colour and Orpington characteristics.

T. W. Lutze (Class II.).—Strong big-framed birds on the big side.

WEIGHTS OF EGGS, SINGLE HEN PENS.

Competitor.	A.	B.	C.	D.	E.	F.	Group.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS.							
G. W. Hindes	2 1/4	1 7/8	2	2	2	2 1/4	2
O. K. P. Farm	2 1/8	2	2 1/8	1 7/8	2	2	2
Range P. Farm	..	2 1/8	1 7/8	2 1/8	1 7/8	2	2
L. G. Innes	2	2	1 7/8	2 1/4	2 1/4	2 1/8	2 1/8
Geo. Prince	1 7/8	1 7/8	1 3/4	1 3/4	2	1 3/4	1 7/8
C. Knoblauch	2	2 1/8	1 7/8	2 1/4	1 7/8	2	2
Oakland P. Farm	2 1/4	2	2	1 3/4	2	2 1/8	2
E. A. Smith	2 1/8	2 1/8	1 7/8	2 1/8	2 1/8	1 7/8	2
G. Howard	2	2	2 1/4	2	2 1/8	2	2 1/8
T. Fanning	2	..	1 7/8	2 1/4	2	2 1/4	2
R. Holmes	2 1/8	2	1 7/8	2	2 1/8	2 1/8	2
T. B. Hawkins	2	2 3/8	2	2 1/8	1 7/8	2 1/8	2 1/8
G. H. Turner	2 1/8	2 1/8	2	1 7/8	1 7/8	2	2
Mrs. Henderson	3	..	2 1/8	2	1 7/8	2 1/4	2
J. H. Wright	2	2	2 1/4	2 3/8	2 1/8	2	2 1/8
C. Porter	2 1/4	1 3/4	2 1/4	2	2	2	2
C. P. Buchanan	1 7/8	2	2 1/8	2 1/8	1 7/8	1 7/8	2
J. W. Newton	2 1/8	1 7/8	2	2	2 1/8	2 3/8	2 1/8
Dixie Egg Plant	1 7/8	1 5/8	1 7/8	1 7/8	1 7/8	1 3/4	1 7/8
J. Zahl	1 7/8	2	2	2 1/4	2	..	2
Mrs. R. Hunter	2	1 7/8	2	2 1/8	1 3/4	2 1/8	2
W. Becker	2	2	2	1 7/8	2	2 1/8	2
E. Chester	1 7/8	1 7/8	2	1 3/4	1 7/8	2 1/8	1 7/8
Quinn's Post R.F.	1 7/8	1 3/4	1 3/4	2 1/8	1 7/8	1 7/8	1 7/8
Mrs. Coomber	2	1 3/4	2 1/8	2	2	2	2
Thos. Taylor	2	2 1/8	2	2 1/8	2 1/8	2	2
J. M. Manson	1 7/8	1 7/8	2	1 7/8	2	1 7/8	1 7/8
Dr. Jennings	2 1/8	2	2	1 7/8	2	2	2
W. Lyell	1 7/8	2	1 3/4	1 7/8	2	1 3/4	1 7/8

WEIGHTS OF EGGS, SINGLE HEN PENS—*continued.*

Description.	A.	B	C.	D.	E.	F.	Group.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
HEAVY BREEDS.							
J. W. Macrae	2 1/4	2	2	2	1 3/4	1 7/8	2
W. Smith	1 7/8	2 1/8	2	..	..	1 3/4	1 7/8
F. A. Claussen	1 3/4	1 7/8	2	2	2 1/8	1 7/8	1 7/8
W. H. Reilly	1 3/4	1 3/4	1 3/4	1 7/8	1 7/8	1 5/8	1 3/4
E. F. Dennis	1 5/8	1 5/8	1 5/8	2	1 5/8	2	1 3/4
Mars P. Farm	1 7/8	1 3/4	1 3/4	1 7/8	1 3/4	1 5/8	1 3/4
A. E. Walters	1 7/8	1 7/8	1 3/4	1 3/4	1 7/8	1 5/8	1 3/4
E. Morris	2	2	1 3/4	1 3/4	1 3/4	1 3/4	1 7/8
R. Burns	2 1/8	1 7/8	1 7/8	2	2	1 7/8	2
D. Fulton..	1 7/8	1 3/4	1 3/4	1 7/8	1 3/4	2	1 7/8
Nobby P. Farm	1 3/4	1 5/8	1 7/8	1 7/8	1 3/4	1 7/8	1 3/4

GROUP PENS.

—	Average.	Variation.
LIGHT BREEDS.		
H. F. Britten	2 oz.	1 3/4 to 2 1/8 oz.
G. Williams	2 ,,	1 3/4 to 2 1/4 ,,
A. W. Walker	2 1/8 ,,	1 7/8 to 2 1/4 ,,
Harold Fraser	1 7/8 ,,	1 5/8 to 2 ,,
W. A. Wilson	2 ,,	1 3/4 to 2 1/4 ,,
S. Wilkinson	1 7/8 ,,	1 3/4 to 2 ,,
Mrs. Anderson	1 7/8 ,,	1 5/8 to 2 1/4 ,,
B. Chester	2 ,,	1 3/4 to 2 1/8 ,,
Geo. Trapp	2 ,,	1 7/8 to 2 1/4 ,,
R. T. G. Carey	1 3/4 ,,	1 1/2 to 2 1/8 ,,
O. J. W. Whitman	1 7/8 ,,	1 3/4 to 2 1/4 ,,
B. Caswell	2 ,,	1 3/4 to 2 1/4 ,,
P. Oldham	2 ,,	1 3/4 to 2 1/4 ,,
J. J. Davies	2 ,,	1 3/4 to 2 1/8 ,,
Shaw and Stevenson	2 ,,	1 7/8 to 2 1/4 ,,
H. B. Stevens	2 ,,	1 3/4 to 2 1/4 ,,
Mrs. A. G. Kurth	2 1/8 ,,	1 7/8 to 2 3/8 ,,
Progressive P. Pens	2 1/8 ,,	2 to 2 3/8 ,,
HEAVY BREEDS.		
E. H. Larsen	1 7/8 oz.	1 3/4 to 2 ,,
J. Fitzpatrick	2 ,,	1 3/4 to 2 1/8 ,,
T. Hindley	1 7/8 ,,	1 3/4 to 2 ,,
H. Puff	2 ,,	1 3/4 to 2 3/8 ,,
W. J. Mee	1 3/4 ,,	*
A. Shanks	1 3/4 ,,	1 5/8 to 2 ,,
T. W. Lutze	1 7/8 ,,	1 5/8 to 2 1/8 ,,

* Not sufficient eggs to secure fair average.

Competitors.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	Total.
						LIGHT BREEDS.								
*Dixie Egg Plant	W. Leghorns ..	139	154	143	143	144	142	140	132	120	116	102	98	1,573
*G. W. Hindes	ditto	85	141	134	136	137	137	144	138	127	118	110	119	1,526
*E. Chester	ditto	95	136	125	130	145	155	145	118	124	104	96	60	1,433
*T. Fanning	ditto	104	119	116	126	131	126	133	137	126	122	107	81	1,428
*W. Becker	ditto	91	116	124	116	133	131	141	132	120	109	79	94	1,386
*Mrs. L. Henderson ..	ditto	114	122	95	127	118	129	136	119	113	118	79	81	1,351
*W. Lyell	ditto	64	127	121	120	134	135	125	126	118	105	93	80	1,348
*Geo. Prince	ditto	90	140	113	118	140	136	130	122	104	96	76	82	1,347
*G. Howard	ditto	76	136	133	132	143	140	125	90	106	83	90	89	1,343
*C. P. Buchanan	ditto	86	138	124	126	136	129	131	119	116	93	85	59	1,342
G*. H. Turner	ditto	74	118	128	123	137	141	137	126	109	91	65	65	1,314
*E. A. Smith	ditto	60	96	123	128	133	140	136	127	103	105	84	75	1,310
*Dr. E. C. Jennings ..	ditto	95	109	94	91	125	126	126	130	119	119	103	67	1,304
*C. Knoblauch	ditto	93	130	126	127	133	131	112	93	79	97	72	89	1,282
*L. G. Innes	ditto	95	91	105	120	135	134	129	121	104	102	85	40	1,261
*Range Poultry Farm ..	ditto	99	102	80	105	115	120	126	124	108	112	96	67	1,254
*R. Holmes	ditto	36	124	134	136	137	131	115	111	104	89	70	63	1,250
*Quinn's Post P. Farm ..	ditto	62	100	94	105	134	144	135	107	108	104	80	72	1,245
*Thos. Taylor	ditto	70	107	96	108	115	114	112	129	126	104	82	82	1,245
*Oakland Poultry Farm ..	ditto	67	126	121	95	132	140	133	124	95	100	63	45	1,241
Mrs. L. F. Anderson ..	ditto	69	64	78	74	128	121	127	114	120	127	118	90	1,230
*O. K. Poultry Yards ..	ditto	92	124	108	103	119	118	117	113	104	84	60	54	1,196
*Mrs. A. T. Coomber ..	ditto	63	76	95	109	128	122	130	117	104	111	76	60	1,191
B. Caswell	ditto	101	108	105	93	122	124	122	110	114	80	47	62	1,188
Harold Fraser	ditto	103	116	88	88	111	95	106	128	119	74	82	69	1,179
*Mrs. R. Hunter	ditto	20	69	88	79	121	130	133	126	121	114	97	80	1,178
J. J. Davies	ditto	67	114	98	102	117	122	119	119	118	101	40	59	1,176
*J. M. Manson	ditto	40	83	74	113	130	129	119	121	111	132	66	56	1,174
Geo. Trapp	ditto	52	90	61	69	106	110	104	123	125	122	103	92	1,157
*Homalayan Poultry Farm	ditto	49	63	97	97	124	134	135	117	109	107	75	33	1,140
*J. Zahl	ditto	52	106	100	95	118	101	115	116	92	86	65	80	1,126
Mrs. A. G. Kurth	ditto	50	94	55	67	114	124	131	119	127	107	71	52	1 111
H. B. Stephens	ditto	44	65	80	75	108	118	124	113	102	110	71	49	1,059
*C. Porter	ditto	71	88	101	112	122	120	94	88	82	75	53	52	1,058
Progressive Poultry Pens ..	ditto	104	56	34	65	88	111	121	107	128	87	80	74	1,055

Competitors.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	Total.
						LIGHT BREEDS—*continued.*								
S. Wilkinson	ditto	80	62	79	96	91	101	115	102	106	72	73	76	1,053
O. W. J. Whitman	ditto	71	109	99	102	108	101	84	98	102	87	34	47	1,042
B. Chester	ditto	37	8	73	99	120	102	116	118	126	91	70	81	1,041
Shaw and Stevenson ..	B. Leghorns ..	8	92	68	91	118	108	117	119	108	88	52	61	1,040
*T. B. Hawkins	W. Leghorns ..	61	78	65	81	122	126	110	81	123	91	51	39	1,028
W. A. Wilson	ditto	3	48	77	71	96	112	115	104	126	89	79	90	1,010
H. F. Britten	ditto	64	75	47	78	104	107	116	112	103	84	68	51	1,009
G. Williams	ditto	82	99	95	70	80	81	96	97	112	67	59	56	994
*J. W. Newton	ditto	62	72	59	68	115	132	128	104	92	75	61	20	988
P. O. Oldham	ditto	34	49	55	66	112	118	119	113	121	93	66	34	980
R. T. G. Carey	ditto	41	96	111	104	110	90	88	70	84	83	32	47	956
A. W. Walker	ditto	13	55	53	39	114	120	123	96	117	76	72	58	936
						HEAVY BREEDS.								
*Nobby Poultry Farm ..	B. Orpingtons ..	89	154	142	145	138	129	105	113	105	96	93	80	1,389
*D. Fulton	ditto	35	28	98	149	164	162	133	139	116	134	92	114	1,364
*R. Burns	ditto	10	67	127	141	146	145	120	123	112	111	101	80	1,283
*E. Morris	ditto	48	87	126	147	141	132	105	117	85	82	88	105	1,263
*Mars Poultry Farm ..	ditto	12	90	123	136	136	129	131	86	89	109	88	96	1,225
*A. E. Walters	ditto	92	87	63	148	157	144	110	95	99	69	84	72	1,220
*E. F. Dennis	ditto	51	101	121	133	144	133	126	79	66	118	60	86	1,218
*W. H. Reilly	C. Langshans ..	95	103	89	87	117	106	110	93	106	104	90	99	1,199
*W. Smith	B. Orpingtons ..	105	75	95	98	124	123	68	114	104	87	96	106	1,195
T. Hindley	ditto	67	132	116	106	123	121	113	93	103	67	72	59	1,172
A. Shanks	ditto	..	42	110	130	138	137	118	102	106	103	76	79	1,141
E. M. Larsen	ditto	24	107	127	119	105	97	94	85	101	116	75	36	1,086
*J. W. Macrae	ditto	40	82	120	123	119	120	55	117	78	76	87	41	1,058
T. W. Lutze	ditto	..	43	72	117	132	130	116	103	109	88	55	66	1,031
*F. A. Claussen	R. I. Reds ..	..	38	94	107	124	107	71	82	89	63	52	48	875
H. Puff	ditto	49	31	74	64	90	87	92	71	85	77	43	56	819
J. Fitzpatrick	ditto	4	22	47	69	124	103	93	77	103	84	48	44	818
W. J. Mee	B. Orpingtons ..	51	99	81	67	98	84	68	67	51	44	49	50	809
	Monthly Totals ..	4,000	5,979	6,297	6,804	8,023	7,947	7,563	7,126	6,932	6,228	4,897	4,447	76,243

RESULTS OF SINGLE HEN TESTS.

Competitor.	A.	B.	C.	D.	E	F.	Group.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS.							
Dixie Egg Plant	235	249	303	229	257	300	1,573
G. W. Hindes	292	244	237	262	253	238	1,526
E. Chester	261	220	232	259	245	216	1,433
T. Fanning	251	221	254	193	253	256	1,428
W. Becker	233	242	214	251	208	238	1,386
Mrs. L. Henderson	234	194	232	193	272	226	1,351
W. Lyell	222	241	243	212	220	210	1,348
Geo. Prince	207	249	205	245	221	220	1,347
G. Howard	220	212	238	257	198	218	1,343
C. P. Buchanan	195	223	242	224	222	236	1,342
G. H. Turner	163	147	259	228	297	220	1,314
E. A. Smith	211	253	198	221	222	205	1,310
Dr. E. C. Jennings	180	277	234	197	226	190	1,304
C. Knoblauch	239	210	232	202	178	221	1,282
L. G. Innes	220	224	302	132	154	229	1,261
Range Poultry Farm	167	241	194	227	219	206	1,254
R. Holmes	209	235	205	209	191	201	1,250
Quinn's Post Poultry Farm	259	207	192	142	241	204	1,245
Thos. Taylor	147	238	211	203	220	226	1,245
Oakland Poultry Farm	180	215	223	215	227	181	1,241
O. K. Poultry Farm	165	236	205	191	222	177	1,196
Mrs. A. T. Coomber	187	205	207	207	162	223	1,191
Mrs. R. Hunter	178	200	149	204	229	218	1,178
J. M. Manson	246	209	238	186	142	153	1,174
Homalayan Poultry Farm	228	184	184	146	210	188	1,140
J. Zahl	231	183	213	211	172	116	1,126
C. Porter	158	192	186	182	110	230	1,058
T. B. Hawkins	211	145	191	152	148	181	1,028
J. W. Newton	190	220	129	128	189	132	988
HEAVY BREEDS.							
Nobby Poultry Farm	281	240	224	130	260	254	1,289
D. Fulton	290	199	207	212	185	271	1,364
R. Burns	190	218	186	202	275	212	1,283
E. Morris	180	202	227	252	216	186	1,263
Mars Poultry Farm	215	223	198	205	184	200	1,225
A. E. Walters	179	222	159	231	220	209	1,220
E. F. Dennis	249	193	192	134	228	222	1,218
W. H. Reilly	197	215	219	178	170	220	1,199
W. Smith	266	198	164	193	167	207	1,195
J. W. Macrae	124	154	192	183	210	195	1,058
F. A. Claussen	151	151	164	146	148	115	875

BALANCE-SHEET.

Receipts.

Entry Fees			£85 0 0	
Sales.	Dozen.	Average Price Per Dozen. s. d.	£ s. d.	
1918, April	$333\frac{4}{12}$	2 3	37 10 0	
May	$498\frac{3}{12}$	2 $3\frac{1}{4}$	56 11 5	
June	$524\frac{9}{12}$	1 $11\frac{1}{2}$	51 7 8	
July	567	1 $3\frac{1}{4}$	36 0 6	
August	$668\frac{7}{12}$	0 $9\frac{1}{2}$	26 9 3	
September	$662\frac{3}{12}$	0 $8\frac{3}{4}$	24 2 11	
October	$630\frac{3}{12}$	0 $9\frac{1}{2}$	24 18 11	
November	$593\frac{10}{12}$	0 $11\frac{1}{4}$	27 16 9	
December	$577\frac{8}{12}$	1 $3\frac{1}{2}$	37 6 2	
1919, January	519	1 $4\frac{3}{4}$	36 4 5	
February	$408\frac{1}{12}$	2 0	40 16 2	
March	$370\frac{7}{12}$	2 2	40 2 11	
				£439 7 1
Total Receipts				£524 7 1

BALANCE-SHEET—*continued.*

Expenditure.

	£	s.	d.	£	s.	d.
Prize Money				50	8	0
Food—Wheat, 314 bushels	72	13	0			
Cracked Corn, 30 bushels	7	9	2			
Hulled Oats, 15 bushels	6	14	11			
Pollard, 390 bushels	32	10	0			
Bran, 195 bushels	15	16	10			
Dried Blood, 5½ cwt.	4	10	9			
Maggitt's Meal, 7 cwt.	2	15	3			
Green Lucerne, valued at	2	0	0			
Soup Meat, valued at	3	0	0			
				147	9	11
Balance				326	9	2
Total				£524	7	1

DO POULTRY FARMS PAY?

Considerable discussion has taken place with the return of the soldiers regarding possibilities of poultry farms as means of livelihood.

The experience of Mr. Giles, of the Bonaventure Poultry Farm, whose advertisement appears in the Journal, is a striking example:—

"I started as a big strong boy, with no capital, but with a good heart, in the summer of 1888. I was sent to do up my grandmother's garden. While there, she told me if I could find the nest of one particular hen that would persist in hiding her movements in the dense scrub I could have the hen. I found her, and was overjoyed at the prospect of being the owner of a bird at last, and tucked her under my arm, and landed her safely at my home two miles away. I put the hen amongst others belonging to my mother, and as I could identify every hen's egg about the place, I was not long in spotting those laid by mine. I did not know her breed. She was pile-coloured and certainly was not pure bred, but had ten toes. For the first twelve months I sold 26s. worth of her eggs, besides letting her raise a clutch of chicks. The first year I did not have to pay anything for food, but of the amount earned I spent a guinea on Barred Plymouth Rock eggs. I put them under my treasure, and she presented me with thirteen lovely chicks, all of which I reared. When I got this clutch I commenced to buy the necessary food. Of the thirteen chicks, five were black, all pullets, and these had to be culled. Of the remaining eight I got three pullets and a cockerel to breed from. The rest I sold for the best prices I could get. For one, I raised 30s., a record which brought joy to my heart. My next move was to get work. For a start I got 15s. a week and boarded at home, for which I paid 10s., leaving me 5s. for myself. My next venture was a pen of Silver Wyandottes, purchased from a neighbour. I saw them at his house one day, and he could see how struck I was on the birds. The price was five guineas, but seeing how anxious I was to get them, the owner, who had known me all my life, said, "If you really want them, take the birds away and pay me when you can." I seized the offer, came home, and built a place for them, and was not long paying for the birds. From this pen I bred both the winning cockerel and poultry from the New South Wales P. P. C. and D. Society. The next year, having a lot of young stock on hand, it was rather a worry to know how to dispose of them. I found a way, however, and built up a first-class connection, and as my capital increased, so I kept on adding stock of various kinds, always the best I could possibly buy. I kept an account of every penny I received or spent. From my earnings I spent quite a lot on the best poultry books money could buy, but when all is said and done, my own powers of observation and experience which I gained from year to year, were the most valuable to me. For a long time everything had to be done on the most economical lines. The buildings were of the cheapest possible construction, mostly of material got from the bush; the house walls were made of corn bags, whitewashed inside and out, with the roof usually of bark—anything to save expense. I had no incubators, and after trying various means and methods of poultry culture

I am more than ever convinced that the best system is to follow the natural way. No matter what I do I cannot raise chickens to suit me like those I rear with hens, abedding the hen under a coop and letting the chicks run out. When the chicks are about a fortnight old I let the hen run out about 9 in the morning, and she scratches for her family. When I read now that so much capital is required in poultry farming, so much of this and that, I often laugh to myself and think how I started with one nondescript hen and no money. From this small beginning, with no help, but a very considerable amount of hindrance, I have built up the most successful business of its kind in the Commonwealth. When I say "of its kind" I mean the breeding of prize poultry, and not ordinary pure-bred utility stock. This necessitates long study —years and years of it, and there is always something to be learnt. The main thing helping to success is love of occupation. If you have no love for the work you cannot hope to make a success of it."

Mr. Giles is always keen to help others and will gladly answer reasonable inquiries, provided that an addressed and stamped envelope for reply be send with other letter.

WATER AS A FACTOR IN EGG PRODUCTION.

The importance of having fresh water before poultry at all times is pointed out in the following from Director C. T. Patterson, of the Missouri Poultry Experiment Station, America:—

A number of pens which had been furnished water at all times were given water only once each day, all they could drink, then the water removed. The results were that the egg yield was reduced 50 per cent. This reduction was the same in the different varieties.

From the hen's viewpoint, water is worth as much as feed, for she can't make an egg with either one alone. Therefore, the man who furnishes high-priced feed but neglects water supply is making a great mistake, and will have to be content with a limited egg yield.

At present prices and weather conditions hens consume about six gallons of water to each 5s. worth of feed. Therefore, if the feed is worth 5s. to the hen, the water is also worth 5s.

The value of water to the hen is shown by the many uses to which it is placed.

First, to soften the food ready for digestion.

Second, in the form of blood it acts as a common carrier, and carries the nourishing part of the food from the digestive organs to the tissues where needed, and carries worn-out or exhausted tissues to the different organs to be eliminated from the body.

Third, water is important as a factor in egg production, as it enters into the composition of the egg as well as the hen's body, the egg being about 75 per cent. water.

Fourth, water is important in equalising the temperature of the hen's body, which is done in two ways. First, cold water lowers the body temperature, while warm water holds the temperature high. For this reason, we give hens cold water in summer and warm water in winter. The second method of cooling is by evaporation, which is a cooling process. The temperature of the human system is reduced by the evaporation of sweat from the surface of the body, but with the fowl evaporation takes place principally through the breathing organs, which accounts for the hen holding her mouth open and breathing rapidly on a hot day.

Observations of experiments conducted at this station lead us to believe that the first three uses of water are very much the same at all times, and that the wide range in the daily consumption of water is influenced by conditions of the weather.

The two lessons which stand out prominently as a result of experiments are:—

First, water is just as important as food.

Second, once or twice each day is not often enough to supply the water.—"Garden and Field."

The Orchard.

LEMON CURING.

By W. E. BEVAN.

I read an interesting article in the "Courier" a few weeks ago in connection with the curing of lemons in Queensland, which brings to mind a very interesting and successful experiment tried by my people some twenty years ago, and which may be of use to those interested in this very profitable pursuit.

At the time I refer to, my father was interested in the culture of citrus fruits, and, being of an experimental turn of mind, he was puzzled to know how it was that, at certain periods, and during the importation of the Messina (Italian) lemons, these lemons brought from 16s. to 20s. per case, while our own lemons, which were of a good type and quality of Lisbon, only returned 2s. 6d. to 4s. 6d.

A case of Messina lemons was then purchased and thoroughly examined, and it was found that they were of an even size and colour, and had been cured, and that in this process of curing they had become very much more juicy than the fresh lemon just cut from the tree. Then, again, they were neatly wrapped and packed.

After many experiments, my father was then quite satisfied that he had hit upon the right method, and that he could produce a lemon equal to the imported article, and, to test this, a dozen cases were procured of the same size as that used by the Italian grower. The lemons were next graded and neatly wrapped in tissue paper with the trade mark of the orchard thereon, which distinctly stated that they were grown in the county of Cumberland, N.S.W., and by whom, and after being packed upon the "Diamond" principle, which was at that time introduced by Mr. Benson, the lemons were sent to test the market against the Messina lemons, and the result was that we received the same price, which proved conclusively that the right article had been produced.

Now, the mode in which our lemons were handled is this:—

Firstly, a large store was erected, about 30 ft. by 20 ft., and 10 ft. high, of split slabs; then outside and around this, about 2 ft. 6 in. away, a second store was erected. This left now a cavity of 2 ft. 6 in. all round, which was filled with earth. The ceiling was formed of heavy slabs, and a mound of earth heaped over the top for a roof. At ceiling height and at floor level, 4-inch agricultural pipes were inserted for the purpose of ventilation, and to allow the gases to escape. By watching the thermometer, which was hung in the store, we found it necessary to plug up or open the pipes occasionally, so as to maintain an equal temperature. This was affected by the amount of fruit in the store and not by outside conditions of weather.

The doors were formed after the style of a strong room; they were framed in pine and were 6 in. thick, having the space between the internal and external lining well packed with sand. These doors, having bevelled edges, shut against felt and were held firmly shut by a lever lock.

For the purpose of illustrating more fully my explanation, I have shown a sketch of the store.

This store, which we termed the "cool store" (and I shall refer to it in future as such), was found to maintain an even temperature of from 60 to 65 degrees throughout the winter and summer; and when not containing fruit was perfectly dark inside.

The next process was as follows:—The lemons were clipped in a green state and laid in large flat wooden trays, which had previously been filled with ti-tree bark, which had been put through a chaffcutter with a long cut. After the ti-tree was dry it was then teased out and looked like soft dry shavings.

The object of the ti-tree shaving was, being of an absorbent nature, it absorbed the moisture from any lemon that might rot, and thus prevented this rot from extending to its neighbour.

I might mention here that the lemons were put into these trays in the orchard and immediately after being clipped. They were then carted down and the trays then packed one on top of the other in the "cool store." The doors were then shut, and the lemons left to cure in an even temperature and in the dark.

Occasionally, the trays were overhauled, and any rotting lemons were taken out, the percentage being very small, and this was due, I fancy, chiefly to want of care.

The result of curing in this store seemed to show that the lemon became more juicy; the skin became thin and tough without crinkling, and a nice light straw colour was obtained.

By this process lemons were kept from four to six months, and on one occasion they were held for eight months as an experiment.

This enabled us to put a first-class article on the market when lemons were scarce, and we were amply repaid for the trouble and outlay.

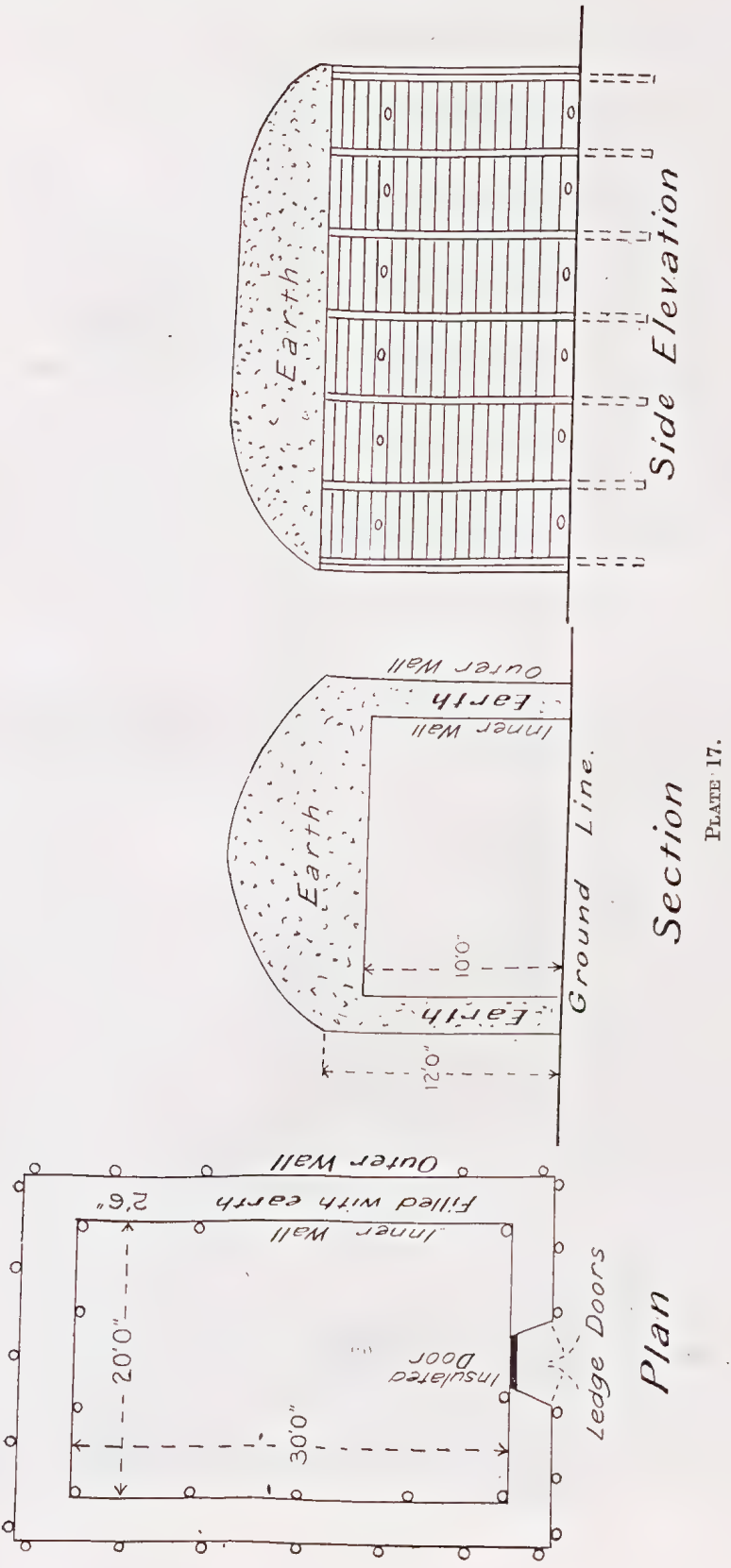
Side Elevation
Earth
Section
Outer Wall
Earth
Inner Wall
Earth
Earth
10'0"
12'0"
Ground Line.
Plan
Outer Wall
Filled with earth
2'6"
Inner Wall
20'0"
30'0"
Insulated Door
Ledge Doors

PLATE 17.

Viticulture.

NOTES ON THE GRAPES UNDER TEST AT THE EXPERIMENTAL VINEYARD, AT COOMINYA, UP TO THE PRESENT (APRIL-MAY, 1919).

By C. ROSS, F.R.H.S., I.F.C., Department of Agriculture and Stock.

Table and Wine Grapes.

It is not intended to give a minute detailed report here, but the following notes may be read with interest:—The vineyard was planted with cuttings during September, 1916. Although the season was late and some of the cuttings dry, they made a fairly good strike, but made only moderate growth during the summer. Before planting, the cuttings were submitted to a potassium-sulphide bath as a protection against "black spot," and regularly dusted with dry sulphur throughout the growing period. In the spring of 1917, after pruning, each vine was swabbed twice with sulphuric acid solution (¾ pint to 1 gallon of water), and as iron sulphate was not added, it caused some of the canes to crack. Dusting and spraying with Bordeaux mixture and dry sulphur was not so successful owing to wet weather, and "black spot" was very prevalent in consequence. It was interesting to note that some varieties have always been free from any infestation, whilst others were affected, to a varied extent, some very slightly and some very badly. The same precautions were adopted in the following spring (1918) except that the formula used for swabbing was changed to 1 lb. sulphuric acid with 3½ lb. of iron sulphate added to 1 gallon of water, with the result that no cracking or splitting of canes occurred. As this season has been dry all through, every cepage in the vineyard is absolutely free from "spot" or other pest.

The behaviour of the following varieties has been carefully noted; those marked with an asterisk have done the best so far, are true to name, and can be safely recommended. Many of those not marked, some of which were planted more recently, may be recommended and distributed after one or two years' further test, viz.:—

EARLY BLACK TABLES.

**Black Frontignac.*—Free growth, rather slender canes, good crop; small to medium sized berries, closely set on cylindrical shaped bunches; colour, brownish red; exquisite flavour; makes a delicious sweet wine.

**Royal Ascot.*—Very strong growth, heavy crop; large berries, close set on shouldered good sized bunch; plumlike flavour when quite ripe.

**Snow's Muscat.*—Good growth, fair crop, medium berries, loosely set bunch, high muscat flavour.

Plate 18.—Gros Colman (Grown on Trellis).

Portuguese.—Good growth, fair crop; a small blue-black grape; its chief merit is its extra earliness; it ripens the first of all the blacks.

**Black Hamburg.*—Strong growth, good crop; the good qualities of this grape are well known.

**Madresfield Court.*—(Early to mid-season); strong growth, good crop; large oval berries on large tapering bunch; delicate muscat flavour.

PLATE 19.—MADRESFIELD COURT.

Mid-Season Varieties.

**Trentham Black.*—Strong growth, good crop, fine berry and bunch, richly flavoured.

**Lady Downe's.*—Strong growth, fair crop, good sized berries, well shouldered bunches not tightly set, faint muscat flavour.

**Cinsaut.*—Strong growth, a fine crop, fair sized berry and bunch. This was the most beautiful looking grape in the vineyard. The flavour is pleasant, sweet, and juicy.

**Wantage.*—Strong growth, heavy crop; medium red berries, fairly loose and well set on large bunches.

**Aramon.*—Strong growth, good crop; useful dessert, and also produces large quantities of wine.

Mid-Season to Late.

**Wortly Hall.*—Very strong growth; handsome large berries, borne on large heavily shouldered bunches. Some seasons bears a second crop on laterals, which will hang well into May if protected from sudden changes of weather.

**Black Prince.*—Strong growth, fair crop, well-known table variety.

Plate 20.—Black Prince.

**Black Alicante.*—Extra strong growth, heavy crop, fine berries on handsome bunches. Will hang a long time if protected from weather.

Late.

**Red Prince.*—Extra strong growth; fair crop; deep red berry, loosely set on large bunches. A fine table grape.

**Red Malaga.*—Strong growth, moderate crop, large berry, long tapering loose set bunch.

**Gros Colman.*—Vigorous growth, good crop, very large berries borne on good sized divided bunches.

**Henab Turki.*—Strong growth; heavy crop; large oval red berries, loosely set on long, large tapering bunches. Suffered from sunscald.

Extra Late.

**Grand Turk.*—Extra strong growth, fair crop, large berries and bunches.

**Black Malaga.*—Extra strong growth; fair crop; fine berries on large, long loosely set bunches. A long keeper.

EARLY WHITE TABLE GRAPES.

**Raisin des Dames.*—Strong growth, fair crop, large oval berries, handsome bunches. Excellent in every way.

**Golden Chasselas.*—Slender but free growth, good crop, medium sized berries and bunches. An excellent first early, pleasant flavoured grape.

**Royal Muscadine.*—Slender but free growth, abundant crop. Another excellent first-early variety.

**Ciotat.*—The old parsley leaved grape. Slender, but free growth, enormous crop, small berries and bunches of rather poor quality. Worth growing only as a curiosity.

**Sweetwater.*—Strong growth, good crop. Well-known variety.

**Chaouch.*—Vigorous, upright growth; heavy crop; large berries, closely set; above average sized bunches. Will not stand wet.

**Ferdinand de Lesseps.*—Vigorous growth, good crop, medium berries and bunches. One of the very best flavoured.

Muscat Ottonel.—Slender but free growth; fair crop; round, medium berries, borne on pretty cylindrical bunches. First early Muscat.

Mid-Season.

**Pedro Ximines.*—Extra strong growth, good crop, medium berry, fine bunch. A favourite in all grape-growing countries. Also used for making sherry wines.

**Bermestia.*—Strong growth, fair crop, fine berry and bunch. A magnificent variety of deep amber colour.

**White Portugal.*—Very strong growth. A moderate crop of very beautiful bunches.

**Trebbiano.*—Extra strong growth. A moderate crop of exceedingly large bunches.

Late Varieties.

**Belas Blanco.*—Extra strong growth, fair crop, large berries loosely set on big bunches.

Gordo Blanco.—Strong growth, good crop. A well-known leading Muscat.

**Dorradillo.*—Strong growth; moderate crop; good berry and bunch, rather close set. Useful late market sort; carries well.

**Crystal.*—Extra strong growth, only moderate crop (requires more age), large berries on beautiful medium sized bunches.

**Servante.*—Extra strong growth, good crop, beautiful semi-transparent berries, average sized bunches.

STRICTLY WINE VARIETIES.

The following have made strong growth and are all heavy croppers:—Tokay (white), Verdellho (white), Quick's Seedling (black), Pride of Australia (black), Oeillade (black), Grenache (black), Carignan

(black), Merlot (black), Terret Noir (black), Carbenet Sauvignon (black). White Sauvignon (white), Alicante Bouschet (black), Cornelian (white), Shiraz (black).

Currants of Commerce.

Zante and Corinth.

PLATE 21.—GROS COLMAN (GROWN AS BUSH VINE).

CUTTINGS AVAILABLE.

Small parcels of cuttings of any of the enumerated varieties, containing not more than twenty cuttings, will be despatched to any address, freight paid, at 2s. 6d. each parcel.

Applications to be made to the Under Secretary for Agriculture and Stock not later than the middle of June, with amount of cost enclosed.

The following varieties have not been sufficiently tested to confidently recommend at present. After further observations have been noted, such of those that are good doers, and can safely be recommended, will be sent out. Some have already been discarded as failures, viz.:—

Mannum.—A South Australian white wine variety; it has made good growth and promises well.

Temperano.—Very poor growth so far.

Sultana.—Grand strong growth, but not yet fruiting.

Santa Paula.—A pinkish variety of the Cornichon type; made fair growth, but not fruited yet.

Riesling.—Poor growth; worthless here. Discarded.

Palomino.—Poor growth.

Champion Muscat.—Indifferent growth on its own roots, but grafted to a hybrid stock it has made vigorous growth, and fruited well.

Muscat of Alexandria.—Grown well, but not fruited.

Waltham Cross.—In wet seasons this is very subject to "black spot." This season it has made moderate growth, perfectly clean and healthy, and bore a few elegant bunches.

Ladies' Finger (Cornichon Blanc).—Good growth, not fruited yet.

Early Green.—Small, white wine; weak growth, apparently of no value here.

Daria.—Poor to fair growth; suggest grafting to resistant stocks.

Centennial.—This is the largest sized white grape known, but it has been quite a failure here. A cool climate, with fairly rich, sandy, well-drained loam is what it requires, but it is never a heavy bearer. It does well at Wallangarra.

Buckland's Sweetwater.—Fairly good growth, fine large berries, but badly scorched with the sun.

Albillo.—A sherry grape; poor growth, not cropping.

Concord (American type).—Strong growth, good crop. Sometimes called Improved Isabella.

Dr. Haag (American type).—Good growth, not bearing.

Allen's Hybrid (American type).—Strong growth, large black berries, medium bunch.

Goethe (American type).—Strong growth, good crop.

Miss Basters.—Good growth, fair sized berry and bunch.

Wood's Red Muscat.—Poor growth, no fruit.

Chasselas Negropont.—Moderate slender growth, good sized early pink variety.

Mrs. Pince.—Moderate growth, not cropping.

Mataro.—Very poor growth.

Malbec.—Very poor growth.

Red Hanneport.—More recently planted. For further record.

Black Mammoth.—Failure.

Roussalet.—Identical with Raisin des Dames.

Admirale de Courtillier.—Failure.

Dattier.—Failure.

Teneron.—Failure.

Malvoise de Sitzes.—Strong growth; a late white of questionable value.

Carbenet.—Failure.

Grand Noir.—Poor growth.

Tinta Amarella.—Questionable nomenclature.

Folle Blanche.—Moderate growth; a leading brandy-making grape.

Pinneau Noir.—Poor growth, but cropped well.

Black Sultana.—Questionable nomenclature.

Duke of Buccleuch.—More recently planted. Further record.

Admiral Sturdee.—Identical with Henab Turki.

Prince Rupert.—Identical with White Portugal.

Flame Tokay.—Recently planted.

Ohanez.—Recently planted.

Plate 22.—Picking Gros Colman Grapes (Grown on Trellis).

PHYLLOXERA RESISTANT VINES FOR RECONSTITUTING VINEYARDS.

The list herewith attached contains the strongest growers and hardiest varieties of Franco-American Hybrids, and are best suited for the purpose they are intended for. They are not grown for fruit production, but used as stocks upon which to work other sorts; being highly resistant to the attack of the vine louse (Phylloxera vastatrix) and also themselves being immune to "black spot," have a tendency to transmit that quality to the scions grafted thereto.

Some are most suitable for wet land and others for dry, viz.:—

Aramon x Rupestris, Ganzin No. 1.
Riparia x Rupestris, 3306.
Rupestris du Lot.
Mourvedre x Rupestris, 1202.
Chasselas Berlanderiü, 41 B.
Riparia—Cordifolia x Rupestris 1068.
Riparia Glorie de Monpellier.
Riparia x Rupestris, $101\frac{14}{1}$.
Carbenet x Rupestris, 33.
Auxerois x Rupestris.

Several thousands of cuttings will be available for distribution this season at 5s. per 100, 3s. for 50, and 2s. for small parcels, inclusive of packing and freight.

Applications should be made before the middle of June to the Under Secretary, Department of Agriculture and Stock, together with the amount of cost.

Tropical Industries.

THE CULTIVATION OF SUGAR-CANE IN QUEENSLAND.

By HARRY T. EASTERBY, General Superintendent, Bureau of Sugar Experiment Stations.

PART II.—SCRUB PLANTING.

In selecting scrub lands it is sometimes possible to market any valuable timber that may be upon it, such as silky oak, bean, maple, cedar, &c., and this should always be done if possible. Tracks should be first cut through the scrubs in order that the land may be thoroughly inspected and valuable timber located. The site of the farmer's dwelling should be placed on the most desirable spot. After brushing the scrub, as it is termed, viz., cutting down all light stuff, undergrowth, and vines, as previously mentioned, the most marketable timber is felled. A good time for burning should be chosen, as the cost of this operation varies considerably. In a dry time the expense is much less when a good burn is secured. Gathering the timber to be burnt in heaps should be most carefully done, so that the subsequent burning, if any, may be of the lightest character. There should be little left but the standing stumps after a good burn. Scrub near a badly grub-infested area should be avoided.

In holing for cane plants it is usual to have the rows made about 5 ft. apart. The distance between the holes varies from 9 in. up to 2 or 3 ft. The number of holes per acre, however, is usually from 2,500 to 3,000. Mattocks are generally used for cane holing, though in some instances, bars, picks, and shovels have been preferred, but the mattock is considered the best tool for all-round purposes. Holes can be made 14 in. long by 9 in. wide, and 9 in. deep. They should always be long enough to take a cane plant with three eyes. Only the very best cane should be used for plants, and the greatest care and supervision should be exercised in this respect. Good varieties only should be planted, and this matter will be dealt with in a subsequent part of this series.

When the cane is up it should be kept clean by means of hoes, at the same time giving the stools as much "cultivation" as possible, *i.e.*, stirring the soil well around the young plants. Roads should also be made for the purpose of getting the cane off at the time of harvest.

Plenty of cultivation by hoeing should be given young cane in scrub soils apart from the desire to keep down weeds, as it materially assists the growth of the crop. Virgin scrub land should not require manures at first, but sometimes a little lime can be used around the cane plants to correct acidity and make a richer juice in the cane. This is often valuable in scrub lands for canegrowing, where the magnesia ratio is too high.

When the harvesting season arrives, portable line is usually supplied by the Mill to the farmer, and trucks sufficient for the daily quota of cane he is to send in, are provided. The line is connected with the permanent 2 ft. gauge, and is laid in the field to suit the cutting.

Cutting is almost entirely done on the contract system under an award of the Industrial Arbitration Court of Queensland. At the present time the sugar districts are divided into three, viz., No. 1 Northern, No. 2 Central, and No. 3 Southern. The rates vary as under:—

	No. 1.	No. 2.	No. 3.
	s. d.	s. d.	s. d.
Crops 15 tons to the acre and over	6 9	6 6	6 3
,, 14 to 15 tons to the acre	7 0	6 9	6 6
,, 13 to 14 ,, ,, ...	7 3	7 0	6 9
,, 12 to 13 ,, ,, ...	7 9	7 6	7 3

and so on *pro rata.*

Burnt or stripped cane (*i.e.,* cane from which the leaves have been removed) is cut at 1s. per ton less than above rates. Cane loaded into drays or wagons, once only, 6d. per ton less than above rates.

Cane on unploughed, stony, or loggy ground 6d. per ton over the drays or wagons, once only, 6d. per ton less than above rates.

A form of agreement for cutting is provided in the award of the Arbitration Court, and can generally be bought at printers' and stationers' shops in cane-growing districts.

The wages to be paid to sugar-field workers as distinct from cane-cutters on contract are:—

	No. 1 District, per Hour.	No. 2 District, per Hour.	No. 3 District, per Hour.
	s. d.	s. d.	s. d.
(*a*) Field Workers over 18 years of age	1 7	1 6	1 5
(*b*) Youths from 14 to 16 years of age	0 9	0 8¾	0 8¼
(*c*) Youths from 16 to 18 years of age	1 0	0 11	0 10
(*d*) Cane-cutters (day labour)	2 1	2 0	1 11¼

The hours worked are not to exceed forty-eight in any one week, but these may be worked between 6.30 a.m. and 6.30 p.m. Accommodation for men must be supplied free, and food also, if required, the farmer being allowed to charge £1 per week in the No. 1 district, 19s. in the No. 2 district, and 18s. in the No. 3 district. Certain holidays are also allowed, in all twelve. Work done on any of these has to be paid for either at double rates or time and a-half. Overtime on week days is reckoned at time and a-half, and on Sundays at double rates. Every canegrower should secure a printed copy of the award.

When the cane is cut it is loaded upon trucks or wagons, and hauled to the mill. It is almost entirely universal in North Queensland to load into trucks upon the portable line. These are drawn out in pairs ,or more, to the permanent line to form a "rake," and are then picked up

by the mill locomotive and hauled to the mill for weighing and crushing. The cane in the trucks should be tightly bound by means of chains, and a rachet wheel placed upon the trucks for that purpose, so as to prevent any cane slipping off in transit, which would be the cane-grower's loss.

After cutting, the trash is burnt, and the area cleaned up. A fresh crop of cane springs from the old "stools," which is known as "first ratoons." The same care is given these, which ultimately develop into a crop which is cut in the same manner as the plant crop. A series of ratoons is usually grown up to five crops on new scrub land, and each burning of the trash helps to destroy the stumps, the extent depending on the class of timber.

When it is decided to put the land under the plough, the old remaining stumps, of which there are generally a good number, are either grubbed out, burnt out, or blown out with explosives.

In taking up land for canegrowing purposes it must not be forgotten that the State Agricultural Bank is prepared to assist canegrowers on very liberal terms, and advances are also made by the sugar-mills.

It will be seen that many implements are not required in cultivating cane on scrub lands while the area is under stumps. Horses, however, are needed for drawing the trucks to the permanent line. A house for the farmer and his family, and if the farm is a large one, barracks for canecutters, will have to be provided. At the present time any estimate of the cost of these would be too high, for, due to the war and the lack of shipping, galvanised iron is most expensive, while timber has also risen greatly in price. It is anticipated, however, that these costs will gradually decrease as we get back to normal conditions.

Varieties of cane and their suitability to different districts will be dealt with later. Meantime, it may be said that the cane known as New Guinea 15, or Badila, has been found most suitable to the Northern scrubs.

It is not wise to leave good land too long under stumps, as the ground worked by hoeing naturally soon gets hard, and an area should be prepared for cultivation purposes as soon as practicable. Although fine crops of heavy cane are usually won from virgin scrubs, the yields begin to decrease in tonnage as time goes on, while on good land, under the plough, properly cultivated and treated, the same yields can be secured year after year, provided the seasons are favourable.

Rainfall is, of course, a factor that requires consideration, and a table showing the average rainfalls in different districts will later on be furnished. It is sufficient to say now that the sugar districts north from Townsville are fortunate in the amount of moisture they receive, and a real drought is practically unknown in the Northern coastal cane districts.

Nearness to a tramway or railway connecting with the sugar-mill to which it is proposed to send the cane, should also be studied in selecting cane lands.

The photograph shown below will give a good idea of scrub land when cleared and partly covered with cane.

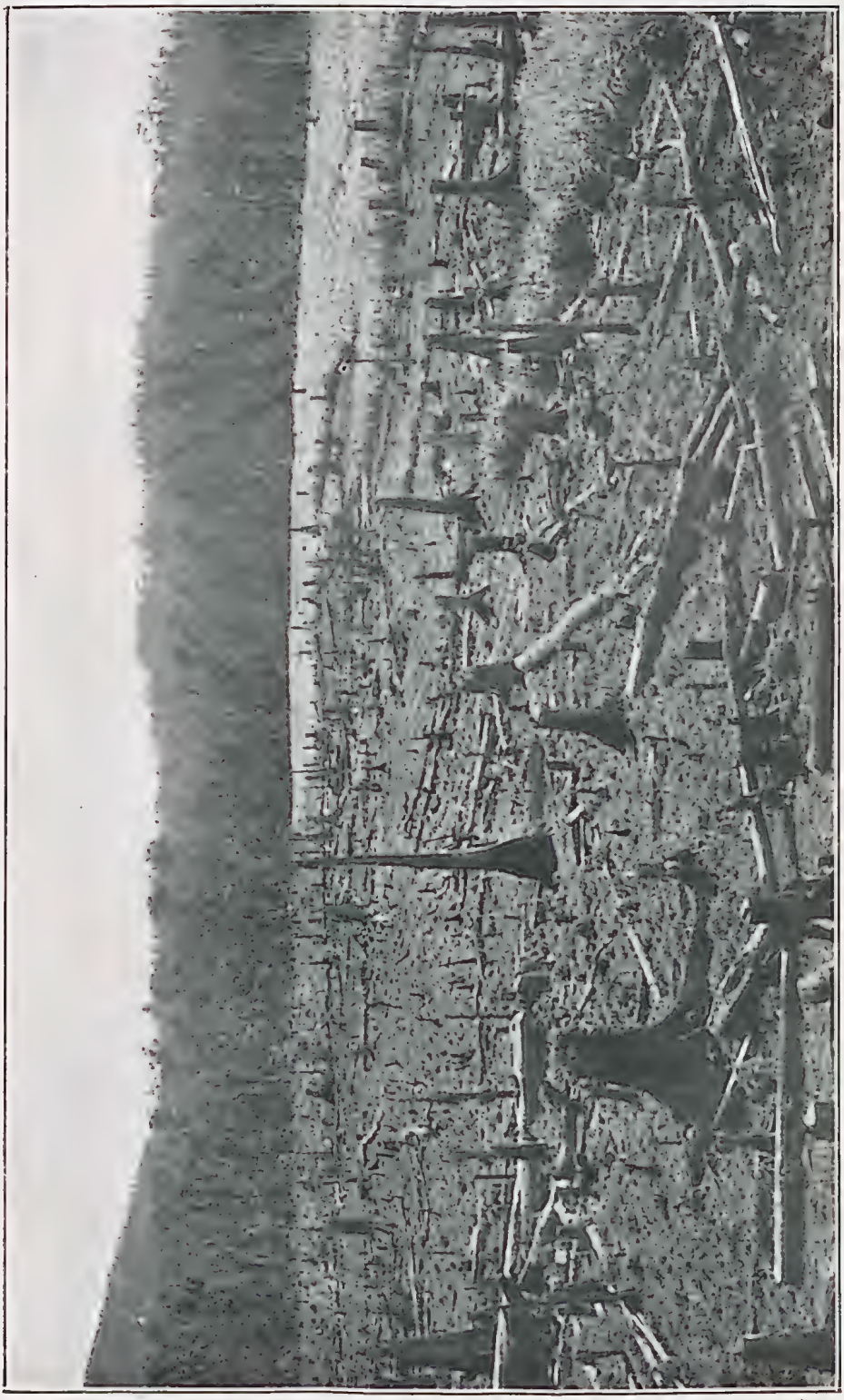

Plate 23.—Part of a Fine Flat on Messrs. Glen and Mackness' Farm "Kuradoon," South Liverpool Creek, South Johnstone Mill Area.

In the foreground will be seen a number of logs that yet require burning, while the timber at the back shows the dense scrub that has to be laid low before operations can be commenced. This particular piece of scrub land is a fine flat on Messrs. Glen and Mackness's farm, South Liverpool Creek, in the South Johnstone mill area, and we are indebted to the "Australian Sugar Journal" for the photo. Crops of cane are seen on the right with stumps here and there.

Cane should always be planted in scrub land, as far as possible, in straight lines, as this is a great help in subsequent cultivation and often enables the land to be brought more quickly under the plough.

(To be continued.)

THE CENTRAL SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"Throughout the month, the canegrowing areas of Gooburrum, Millbank, Waterview, Bucca, Bingera, the intermediate areas between the latter place and Gin Gin, Wallaville, Currajong, Fairyhills, and Gin Gin have been visited.

"GOOBURRUM.

"At the time of visiting this place, conditions were very dry. The cane was parched and lifeless-looking, and in numbers of cases the young cane had died. Misses after planting were frequent, owing to the plant having lain long in the ground without sufficient moisture to force growth. There was very little standover cane in evidence. Wells, water-courses, and dams had dried up. The farmers did not anticipate a cutting, even if rain did come. Owing to the hardness of the soil, deep cultivation was very difficult. Therefore the chances of conserving sub-surface moisture were not as great as if more intensive cultivation were possible. Seepage is considerable in this area, owing to the nature of the lower soil strata. The farmers are not troubled with noxious weeds to any great extent. Small patches of paspalum, nut, and red Natal grass are evident, though not in sufficient quantities to cause much anxiety. The well water here appears to contain magnesia and sodium chlorides. It is improbable that it would be suitable for irrigation. D1135 is the principal cane growing. There is a small quantity of Black Innes, Mahona, and Clarke's Seedling. Most of the growers, however, are still pinning their faith to the former variety.

"Since these observations were made, good rains have fallen at Gooburrum, and at a casual glance from a distance, cane seems to have a new lease of life, changing from the yellowish white to a deep healthy green.

"WATERVIEW.

"This area was visited before the rain. The loose sandy nature of the soil and subsoil is not conducive to the conservation of moisture, and the cane here suffered severely. The hardihood of the D1135, however, saved many farmers from having to plough out, and now that the rain has come, although it is improbable there will be a cutting during 1919, the losses should not be so severe as anticipated before the change of the weather. Greater planting of green crops is necessary here, as well as liming. Most of this land has been under cane for many years without a spell, and tests show a considerable acid reaction. It is noticeable that all farmers who had been going in for green manuring and deep cultivation weathered the drought much better than those who did not. No mechanical traction for agricultural purposes was noticeable at Waterview, most of the growers using horses and the usual types of disc ploughs, cultivators, &c. Very few had been going in for liming—a matter that requires attention by the farmers if they wish to improve their present output. Insect pests have not given the farmers much trouble. The farms are fairly free from weeds and present a clean well-kept appearance, although more intensive cultivation is advisable, especially now the rain has put in an appearance. Intensive cultivation will give gratifying results to the farmer, if diligently carried on. There are no immediate local sources of lime about these areas. Most of the growers have got to go far afield if they wish to obtain a supply of burnt lime.

"Most of the labour is done by co-operation.

"BUCCA.

"Bucca was visited before the rain and presented the usual parched appearance. The principal varieties growing are 1900 Seedling, D1135, and Mahona. In the opinion of some of the farmers, the 1900 Seedling is a cane that will do well here. Mahona is a cane that has been growing for some time past, but the growers are doing away with it to a large extent. Bucca is at present unfortunately situated. Sugar-growing is at a standstill pending satisfactory arrangements for milling accommodation.

"MILLBANK.

"Owing to the dry weather, this area, which usually grows fairly heavy crops, is very backward. As heavy a cut as 100 tons to the acre of D1135 has been harvested here.

"The soil is fairly rich in humus and has a slightly alkaline reaction for the most part. At the time of visiting, the farmers were pessimistic as to the proceedings for this year, even if rain fell. Rain has fallen since, however, although owing to the backward condition of the crop, it is unlikely there will be any fit to cut.

"Water is found at about 40 ft. on some of the holdings, although it is doubtful whether it would be suitable for irrigation.

"This is an area which requires intensive cultivation, the continual stirring of the soil particles keeping them from binding, there being a tendency to do this, owing to the nature of the ground. There is an increasing demand amongst the growers for more varieties. It is the consensus of opinion that the available canes are being worked out, or rather, unsuitable in these latitudes.

"BINGERA.

"This area was visited just prior to the rainfall. The plantation management was busy irrigating a plot of standover cane.

"In comparing these areas, with regard to suitability for irrigation, with places like Ayr, it is noticeable that seepage here is greater than at the northern town, thus involving more work in the matter of irrigation. The pump being used at Bingera is probably the largest in Queensland. Through the courtesy of the management, I was shown over the plant and given an insight into their methods of irrigating. Bingera, this year, is going in for both extensive and intensive cultivation. Mechanical traction is aiding the work and agricultural operations are proceeding rapidly.

"The principal varieties growing are D1135, Badila, and Mahona. The first-named cane is still retained as a standard variety, although in a lot of cases it is degenerating very much. Mahona is considered unsatisfactory on the red soils, and it is unlikely any more of this variety will be planted. The soil is principally red volcanic, with clayey subsoils, interspersed with igneous formations. New varieties are urgently needed if the industry is not to suffer in this area.

"SOUTH KOLAN.

"This district was visited during the drought, and had a very thirsty appearance. The growers here, however, study their work keenly, and in many cases, by dint of hard labour and intensive cultivation, have done a lot to ward off the effects of the drought. One farmer at South Kolan, Mr. T. Bates, as an experiment, planted 4 acres of D1135; eight rows of the plants he soaked before placing in the ground; these came up several days before the unsoaked and had a much more flourishing appearance. It is likely, though, that if rain did not come soon after the soaked plants came up, they would deteriorate quicker than the unsoaked ones.

"The varieties growing at South Kolan are D1135, H.Q.114, 1900 Seedling, N.G. 16, M. 54, and Badila. Of these, the 1900 Seedling and the D1135 appear to be doing best, although N.G. 16 has a decidedly healthy appearance, and seemed to stand the drought well. The soil here, in places, is a sandy loam with a clayey subsoil; in other places it is a red loam with patches of sterile soil and a clayey subsoil interspersed with silica and alluvial deposits. There are no immediate local sources of lime.

"GIN GIN.

"The soil is a red loam on the ridges, alluvial in the hollows. The principal canes growing are D1135, 1900 Seedling, Mahona, and Malagache. Some small areas of Malagache, planted the second week in October, look strong and healthy and withstood the drought without getting the extremely wilted appearence of some of the other varieties. 1900 Seedling planted in September, also held its own. The ridges on the Gin Gin farm areas require more vegetable matter than they at present contain. Mauritius bean and cowpea could be planted with profitable results, thus assisting to retard the escape of subsurface moisture.

"The effect of the rain on cane here has been most marked, the plants almost immediately responding, changing colour from their unhealthy whitish yellow to a rich green.

"Most of the farms here are well drained, although it is necessary on the farms which lie in the lower levels to do a fair amount of artificial work in this respect.

"Most of the growers in this area have had very satisfactory strikes, this being due to careful selection of plants. There are considerable local sources of lime in the environs of the Gin Gin cane-producing areas, which would be a boon to the farmers if opened up.

"CURRAJONG.

"This area was visited just about the time the first rain fell. The young cane has made a splendid response, particularly the 1900 Seedling. This variety does very well at Currajong. The soil is a sandy loam, interspersed with patches of red loam, appearing to be suitable for the Mauritius Seedling.

"It is unlikely that there will be any cane cut here this season, although some of the farmers have a few tons of first ratoon standover.

"The farmers here understand the value of intensive cultivation, most of the holdings being well kept and free from weeds. The soil is very loose and friable, thus making a fine surface condition possible. Soil tests taken show varying reactions as regards alkalinity and acidity. Liming, however, would be beneficial to most of the farmers about Currajong; also planting of Mauritius bean or cowpea as a green manure.

"One or two growers are giving their cane land a spell and planting maize, sweet potatoes, &c. The rotation of crops such as these is advisable and will be beneficial. In most cases it is legumes or leguminous crops that are substituted.

"FAIRYHILLS.

"The rain had just started at the time of visiting Fairyhills.

"The principal canes growing are D1135, Mahona, Rappoe, 1900 Seedling, B156. Many of the farmers are displacing D1135 with Mahona. Others are getting excellent results from Rappoe.

"On some of the holdings the rain that had just commenced was showing itself to good effect on the first ratoon standover; also on the December planting. Owing to the hard time, however, that the March plant cane has had, it will take some time before an appreciable difference is made in the appearance of this. The soil here is principally a red loam, interspersed with silica, and, in some places, quantities of limestone. It has a gravelly loam subsoil and drains well. There is a considerable amount of lime about Fairyhills, which would be of the greatest advantage to the growers, if worked.

"So far, the highest tonnage per acre that has been taken off Fairyhills has been about 50 tons to the acre of Rappoe. Green manuring is very necessary in these areas.

"MAROONDAN.

"The farmers in the Maroondan area were not so fortunate as regards rain, at the time of visiting, as in the other Gin Gin localities, not sufficient having fallen to make the heavy black soil sticky. The loam is heavy and dark, with a heavy clayey subsoil containing marine, alluvial, limestone, granite, diorite, and igneous formations.

"Last season it was gratifying to note that the farmers have almost achieved a record in the way of getting high tests for their cane. The following are a few of the results:—

Clark's Seedling test	17.12 density
1900	17.13
Mahona	16.74
D1135	15

"It will be seen by these results, that whatever the tonnage may be, the sugar content is high. Extensive green crops, to insure the supply of natural green manures, are necessary about Maroondan. Also, on some of the farms, burnt lime to the extent of about 25 cwt. to the acre would be beneficial, as the soil, in some cases, has an acid reaction, and is very tenacious when cultivating. Some plants of 1900 Seedling have been attacked by fungus, but nothing serious has resulted, the stools attacked having been destroyed. Water is to be found at a depth of about 30 ft.

"With regard to the varieties growing, speaking from observations made, it would appear that 1900 and Clarke's Seedling were the two canes that could be most profitably grown. Mahona, as a plant crop, is good, but it is very shy in ratooning. Noxious weeds are in evidence to a certain extent, although they are not causing much trouble. Principal among them are paspalum, nut grass, couch, convolvulus, sida retusa

"WALLAVILLE.

"The days allotted for visiting Wallaville were interrupted by a considerable amount of rain. Consequently, I was unable to carry out the work intended on this area. From what observations that could be made, however, the cane appeared to be suffering very much from the drought, having a lifeless and yellow appearance. The soil is a red loam on the ridges and principally alluvial in the hollows. From what could be observed, the D1135 and 1900 Seedling seemed to have held out best against the dry spells, which, at Wallaville, appear to have been exceptional previous to the 13th February. A little irrigation is in progress on lucerne at Wallaville, but none of the cane was being watered.

"AVONDALE.

"At the time of visiting Avondale good rains had fallen, and the effect on the cane was very marked, especially about Tegege. The soil in this area is probably a sandy loam, with a sandy subsoil. It cultivates and drains well. Some of the farmers have small areas of second ratoon standover, but there will be nothing fit to cut this season.

"Avondale Plantation has, however, about 70 acres of D1135, which seems to have displayed considerable hardihood in withstanding the drought. The farmers here have been getting an average density of about 14. As regards noxious weeds, nut grass is very bad. The farmers have simply given up trying to combat it, and let it grow. They find that when it attains a height of about one foot it dies down. If this is the case, providing the cane is sufficiently vigorous to combat it during the early periods of growth, it should not be so harmful as is generally supposed. There is a great growth in other grasses and legumes. In much of the plant cane there is a very high percentage of misses, owing to the dry conditions. Some of the farmers are doing a considerable amount of cowpea sowing as a green manure. Most of the growers understand the importance of drainage and have good systems.

"WATERLOO.

"Canegrowing has been abandoned altogether at Waterloo, owing to the closure of the mill. The land that has hitherto been growing cane here is found to be very suitable for pineapples and bananas, and many of the settlers are planting these products.

"The greatest courtesy was extended to me by the mill authorities and the growers at the different centres visited."

THE MACKAY SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray, upon the Mackay sugar districts:—

"Throughout the month the Mackay sub-areas of Pleystowe, Racecourse, Farleigh, Sarina, Hatton, Pinnacle, Gargett, Marian, and Mirani have been visited.

"PLEYSTOWE.

"Conditions are fairly encouraging from a farmers' point of view. The weather has been favourable for growing, and much of the cane is very forward. More rain is needed, though, between now and the crushing if expectations as regards tonnages are to be fulfilled. Coots are the worst pest, and are a very considerable menace to the young cane. Other birds, like crows, ibis, &c., are very useful in canefields. Nut grass presents more trouble than any other noxious weed, whether indigenous or introduced. Generally speaking, the growers here understand the necessity for intensive cultivation. As in most sugar areas, those farmers who cultivate, drain, and green manure thoroughly get far the best results. Lime is required in the Pleystowe areas, as on an average the tests taken of the soil show an acid reaction. Labour is carried on by individual effort in the off-season. Not a great deal of trouble has been experienced during the cutting in the past.

"RACECOURSE.

"This area looks well. The principal varieties growing are Clark's Seedling, D1135, Badila, and Cheribon. Clark's Seedling, however, seems to be the most satisfactory from a farmer's point of view, growing with a good density, stooling and ratooning well. On some of the plots, where the river has overflowed and left heavy deposits of silt, the Badila has made extraordinary progress. Considerable trouble is caused by the nut grass. Of the pests the farmers have to contend with, the coots are the worst. These birds play havoc with the young cane, speedily destroying considerable areas. The land here has a fair system of surface drainage. Lime is very necessary on some of the farms. This, however, is very hard to obtain in suitable quantities for agriculture, the cost also making it prohibitive. If the farmers on these areas could obtain quantities of burnt lime at a moderate price, their outlay should be justified owing to the necessity of neutralising the acid in the soil. The soil around Racecourse seems to contain fair quantities of humus, the farmers in the past having kept in mind the value of green manuring. Cowpea is a favourite green crop with them, but at present it is difficult to get the seed. Other growers plough in green maize, some let the maize ripen and plough in the lot. This planting of green manures and rotation of crops is not only an excellent thing from an agricultural point of view, but it also largely contributes towards keeping down the grubs, borers, and fungoid diseases, by temporarily destroying their homes. Except in cutting season, most of the growers do their own work. The farms are fairly clean and free from weeds. Very little labour trouble has been experienced lately. The weather during the last month has been excellent for growing, the cane having progressed more than it usually does at this period of the year, owing to more moderate rains than generally prevail between New Year and the Equinox.

"FARLEIGH.

"This area shows fair promise this year. The varieties principally growing are Clark's Seedling, Goru, D1135, M.S. 1900, and Malagache. Other varieties that are being tried include Badila Seedling, Q1121, Q813, Q970, and Hybrid No. 1. All these canes look well and healthy, having a flourishing appearance. Some of the Clark's Seedling, where the land is more fertile than the average, is falling down, having made too vigorous a growth. Badila on the same soil is standing and growing well. As on other Mackay areas, the majority of the Farleigh farms require lime. Green manuring has been gone in for to a certain extent, cowpea being the favourite crop. As regards planting, most of the growers use the top plants and change as often as possible. Most of the labour in the off season is done by the farmer himself. Growers here mostly cut up and plough in old stools. Trash is burnt. Ratoons are seldom volunteered. Farmers here are not troubled much with pests, excepting the coots.

"HATTON, PINNACLE, GARGETT.

"These areas look fairly prosperous, there being indications of a cutting well up to the average. The soil—a light sandy loam with a clayey subsoil interspersed with alluvial deposits—cultivates and drains fairly well. The principal varieties growing—D1135, Goru, Clark's Seedling, and Malagache—are doing well. In the case of the latter it grows luxuriantly, with plenty of cane and a fair density of about 13 per cent. It has very little top, though, so consequently if a farmer grows much of it he gets very little chopchop. Not much trouble is experienced with cane pests, bush rats in the uplands and coots on the river flats being the worst the growers have to deal with. The farms here are fairly rich in humus, but want more intensively cultivating and liming, especially the latter. The growers, however, realise this, but adverse circumstances over which they have no control militate against them at every turn. Water is to be found by sinking at about 30 feet.

"MARIAN, MIRANI.

"These areas are well up to the average as regards cane growth and general prospects. The principal varieties growing are Malagache, Badila, D1135, M.S. 1900, and Otamite. The first three varieties appear to be favoured by the farmers, testing

on the average:—Badila, 15.05; D1135. 13; Malagache, 14. There are, however, some very fine plots of 1900 Seedling. This cane could be grown, when the land is not badly frosted, more extensively than it is. It grows with good density, is easy to cut, not extra heavy in trash, and has a good top for chop-chop. The soil in these areas is a light loam with a clayey subsoil. It cultivates and drains well, seepage being considerable on the river flats. Tests taken of the soil show a slight acid reaction. The use of lime could be recommended here. A fair amount of green manuring has been gone in for, also a rotation of leguminous crops on some farms. Mr. Paul, a Marian farmer, achieved a marked success with molasses as a fertiliser. He allowed the molasses to run broadcast over his land, using a tank on a dray for the purpose, to the extent of about 1,200 gallons per acre, and ploughed in. About 4 acres was treated in this manner, and about 8 acres of Clark's Seedling planted, four on and four alongside the piece treated. The result was that the fertilised cane easily beat the other in every particular. Glancing along the headlands the eye is immediately arrested at the termination of the treated ground by the marked difference in the tops of the Seedling. One droops while the other holds itself up in a most marked manner, causing a startling contrast. The general appearance of the cane on the fertilised portion is much superior to the other. A marine deposit containing lime is being worked near Marian, but opinions vary amongst the farmers as to its value as a fertiliser. With regard to pests at these places, coots are the worst. The farmers change plants amongst themselves as often as possible. Very little volunteer ratooning is done, most of the growers burning trash and cutting up and ploughing in old stools.

"SARINA.

"The following are the most satisfactory canes growing:—Q.903, c.c.s. 15; Badila, c.c.s. 15.05; H.Q. 114, c.c.s. 14.89; Q 116, c.c.s. 14; D1135, c.c.s. 13. It will be seen by these tests that the above canes are fairly satisfactory. Of the first named variety there are only a few stools at present, but the growers hope to obtain more for planting next year. M.S.1900 is, however, a good cane on some of the holdings. The soil about Sarina is a heavy dark loam interspersed with alluvial deposits, containing alluvial and igneous rock. The land drains well, both as regards surface and subsurface moisture. Lime is needed in these areas, also more intensive cultivation and green manuring. Weeds grow very fast here, and consequently, as many of the growers have only themselves and perhaps one helper to depend on, the chipping rather gets out of hand. Noxious weeds and grasses include Paspalum, Rhodes, Kangaroo, Red Natal grasses, while "Stinking Roger," Star Burr, Convolvulus, also flourish. Bush rodents and coots are the principal pests. A couple of tractors are in use in the district, but the farmers do not seem to be enthusiastic about them. I am indebted to the various mills visited for much courtesy shown me, also the farmers for their assistance and courtesy."

A POSSIBLE FACTOR IN COCONUT BEETLE CONTROL.

"Tropical Agriculture," Ceylon, reprints the following note from the "Review of Applied Entomology," vol. vi., pt. 5, on the above subject, which will doubtless prove of interest to our Northern and Papuan readers:—

"A natural enemy of the coconut beetle (*Oryctes*) in the Philippines has been found by Mr. F. Warner in the island of Bohol. This is a flying lemur *Galeopithecus sp.*, which has been domesticated by the Filipinos, and bred, partly for the value of its skin, which is used for the making of hats, and partly for catching coconut beetles. This small animal is insectivorous and harmless, the only vegetation eaten by it being the leaves of the jak, *Artocarpus integrifolia*. Nothing is known of its breeding habits. Its flesh is said to be poisonous, which renders it unlikely to have many natural enemies, so that if it can be multiplied rapidly and if, as reported, it is of a non-roving disposition, it should prove of value in the control of the beetle.

Entomology.

GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from the Entomologist, Dr. J. F. Illingworth:—

"The heavy rains starting on the 25th of February have saved the day in many of our canefields. Conditions were prime for the grubs, and they were getting in their work to an alarming extent. As usual, Greenhills was the first to show the characteristic yellowing in the affected portions. Some of the ratoon fields lying near the woods have already succumbed in spit of the rains.

"FEEDING TREES.

"Continuing a study of the relation of feeding trees to infestation, I have made further interesting observations; and I can now say with some confidence that the beetles travel approximately half a mile when going with the wind, but scarcely any against it. These conclusions are based upon numerous observations in a number of localities, and in no case have I found evidence to refute the theory.

"As pointed out last month, the infested areas at Greenhills lie principally within the half-mile limit, and the worst infestation is in the higher parts of the fields lying near the feeding trees.

"I have recently instituted careful surveys in the infested areas, by counting the number of grubs per stool of cane. As a typical example of this method I may cite a field of first ratoons, at Greenhills, where, by working at a gradually increasing distance back from the forest, we got the following grubs:—14, 13, 15, 8, 3, 1, the last stool being just about on the half-mile from feeding-trees to windward. Another excellent example, which works out in perfect accord with this theory, is an infested farm near Gordonvale. Feeding trees border it to windward, south and east, and the principal infested areas are on the side toward this timber. The worst infested fields are now out of cultivation, having failed completely last season. However, I was able to get the following remarkable figures, by taking the average of a series of stools:—

Chains from the Forest.	Grubs per Stool.	Class of Cane.
12	45	Badila, 1st ratoon.
16	17	Badila " "
19	13	Badila " "
22	12	Badila " "
28	7	Goru " "
35	5	Goru " "
40	0	Goru " "

"The same decrease in the number of grubs per stool is shown in every part of the farm as one recedes from the feeding trees.

"CULTIVATION EXPERIMENTS.

"As stated in last report, I was unable to get these experiments started in time to get the maximum benefits from them. Nevertheless, they show us that there is no material difference between working the soil once a week and once a fortnight; also, that the plough has considerable advantage for disturbing the grubs.

Every week—	
Plough, average number of grubs per stool	5
Cultivator " " " " " "	8½
Harrow " " " " " "	9½
Every fortnight—	
Plough " " " " " "	6
Cultivator " " " " " "	8
Harrow " " " " " "	7½
Check " " " " " "	13½

"The check in this case does not show its true value, for it was cultivated twice after the experiment began, in spite of my instructions to the contrary. Still, the better cultivation in the other plots is very noticeable from the figures.

"There is very decided evidence that cultivation as a means of control must begin during the two weeks after the beetles emerge, before they start laying. Apparently, once the eggs are deposited, it is a difficult matter to destroy all of them by horse work, for they are probably placed near or under the stool. The fields that got this cultivation are in excellent condition at present (14th March), and have a fine dark colour. The field J1 is a good example, since it has suffered from the grubs in former years. It is worth noting that it was planted very late last October, for J4, which was planted in August, is suffering severely from grubs and is located just across the tram line, and more distant from the feeding trees.

"Right in line with this argument, I might mention the two ratoon fields, L7 and the lower half of L6, which were cut in November and ratooned while the beetles were on the wing. They are both in prime condition, with no apparent signs of grubs, while several of the fields nearby are already going yellow. It will be recalled that these fields were planted in October, 1917, and gave successful cuts last season.

"ON THE VALUE OF GREEN CROPS.

"The finest cane on the Greenhills estate is in the part of F3 which was planted to Mauritius beans. The lower part of this block was not treated, and it is an easy matter to see where the beans left off, for the cane is shorter, and is badly yellowing from the attack of grubs. All of this block was a failure last time it was planted.

"MERINGA EXPERIMENTAL PLOT.

"The cane in these plots is in excellent condition, especially the areas which were under beans. All of the fifteen plots, which include the checks, have had frequent cultivation during the whole flight of the beetles, and this probably has considerably reduced the number of grubs.

"While it is rather early to draw conclusions, I would say, from tests that we have made of individual stools in the various plots, that white arsenic gives considerable promise when used in the drill at the time of planting, especially when mixed with meatworks manure, which the grubs appear to favour as food.

"CARBON BISULPHIDE EXPERIMENTS.

"The following observations were made on a badly-infested field (B1, of Gordonvale farm) of first ratoons. By digging test stools early in February, while the cane was still of good colour, I found that the number of grubs ran from 8 to 49. The owner decided to apply carbon bisulphide, and this was started on the 18th February. The application was made with the ordinary Dank's pump, set so that the discharge was about 3 in. beneath the surface. The maximum charge was given (slot No. 9 = 1 drachm and 55 minims) on one side of the stool, to start with, but the middle of the field was treated on both sides of the stool, using the same charge. Finally, the last part of the field was not treated, for heavy rains (about 10 in.) started on the 25th of February.

"On 8th March I examined this field for grubs, and found excellent results. Along the south side of the field, where we had previously found an average of 45 grubs per stool, I could only get an average of 5. No dead ones were visible in the soil, for they had probably rotted and been carried away by ants. This was the part treated on one side only.

"In the middle of the field, where the stools received treatment on both sides, I was unable to find a single grub, and there was a vigorous growth of new roots starting. The tops, too, looked beautifully green with no sign of injury from the treatment. I had previously found an average of 13 grubs per stool in this location. Evidently the rains which followed, a day or so after the application, saved the cane from any ill effects of the chemical.

"I also found that the grubs were still numerous in the untreated portion, and the cane was showing a very noticeable withering, in marked contrast to the treated plants.

"EXPERIMENTS WITH NITROGEN FERTILISERS.

"Our field experiments with these chemicals are not completed, but there are some observations which should be noted. Experienced growers know that the best results come from the application of these fertilisers after the rains begin. They then give the cane the maximum boost. In our experiments with both nitrate of soda

and sulphate of ammonia to determine their value in making the cane resistant to grubs, I find that where these chemicals were applied during the dry weather in August their effect upon the growth of the cane has not been noticeable, and in the treated field at Greenhills the grubs are showing considerably. On the other hand, where ammonia was applied during January, the cane shows a remarkable development and improved colour; and though I found grubs under some of the stools the numerous new roots are keeping up the vigour of the plant. In another month the contest will be decided, for this is the worst season in the activity of the grubs.

"In order to determine the direct effect of these two chemicals upon the grubs, I placed them in soils with varying amounts of the fertilisers, giving them no roots to feed upon. The experiment was carried along for ten days with no noticeable effect. Several of the grubs became injured and died, but those that remained were perfectly normal at the finish. Hence, I would conclude that the control exerted by these chemicals lies principally in the increased vigour that they give to the plant.

"EXPERIMENTS WITH MOLASSES AS A BAIT.

"One might naturally conclude that molasses would be attractive to grubs if placed in the soil. It was recently suggested that this would act as a valuable bait if mixed with poisons. Experiments, however, have demonstrated that the grubs will not eat it—at least, not enough to be of value. Where the same amounts of arsenic were used alone in the soil, results were very rapid—the grubs dying in one to four days. Even the dry white arsenic gave splendid results. Since this chemical has a great affinity for humus, and remains in the surface soil for years, it may prove best to apply it in the drill at the time of planting, or possibly dust it around the young plants, so that the grubs will come in contact with it when they begin their depredations.

"INTRODUCTION OF PARASITES.

"That we may leave no stone unturned, I have continued investigations of the available parasites of white grubs in other sugar-growing countries. There are a number available, though it is problematical whether they would prove of value against our native insects. Anyway, it is worth trying, for if we can get them to attack any of our numerous Scarabeids (root-feeding grubs) the expense of introducing them will be well repaid. These valuable friends are doing excellent service in countries like Hawaii, Porto Rico, Mauritius, &c.

"It will be interesting to quote from a letter just received from D. D'emmerez de Charmoy, entomologist, of the latter country. He says:

"'There are several parasites of white grubs here. Apart from *Dielis rufa*, an indigenous species parasitic upon two of our melolonthid grubs, *Rhizotrogus gravidus* and *Rhizotrogus pallens*, the others have been introduced.

"'I am sending you a copy of a bulletin on the introduction of *Typhia parallela*, in which you will find a detailed account of the introduction of this parasite, as well as a general description of the spread of its host, *Phytalus smithi*.

"'The other principal pest of sugar-cane is *Oryctes tarandus*, which has lately been the cause of considerable damage to canes in certain parts of the island; so much so that I went to Madagascar in 1917 for the purpose of bringing over certain Scoliids, which I thought might prove parasitic upon *Oryctes tarandus*. The details of this introduction are set out in the report I am sending you.

"'Since the publication of this report, *Scolia oryctophaga* has been found in places where the insects had originally been liberated, so that I think the parasite to be definitely established. Its effects in checking the spread of *Oryctes tarandus* is now only a question of time.

"'I am extremely interested in the work undertaken in Queensland, for the purpose of controlling cane grubs, and feel certain that your efforts will result in complete success.

"'It would be a real pleasure for me to help you in any way, should you require my services.'"

TO DESTROY RATS.

When a house is infested with rats which refuse to be caught by cheese and other baits, a few drops of the highly-scented oil of rhodium poured on the bottom of the cage will be an attraction which they cannot refuse.

General Notes.

IMPURE STOCK FEEDS.

ADVICE TO FARMERS.

The Department of Agriculture and Stock has lately received information of the landing, ex s.s. "Camira," of a consignment of what is termed "Mill Offal," and is probably intended to be sold in some form or other as feed for young stock. The advice received from the port of shipment is that it is a mixture of ground weevils, mice excreta, mill sweepings, &c., and until lately was unsaleable in South Australia.

It is for dealing with such matters as this that the Stock Foods Bill which was presented to Parliament last session is intended to cover, and farmers should be careful when purchasing composite foods for their young stock.

HOW TO LAY OFF AN ACRE OR LESS.

"The Farm," Adelaide, gives the following useful rules for calculating small areas of land:—

I.—TO GET ONE ACRE MEASURE.

Rod Measures: 10 x 16; 8 x 20; 5 x 32; 4 x 40.

Yard Measures: 5 x 968; 10 x 484; 20 x 242; 40 x 121.

Feet Measures: 208.7 x 208.7; 220 x 198; 110 x 396; 60 x 726; 120 x 363; 300 x 145; 400 x 108.9.

II.—TO GET LESS THAN AN ACRE.

To measure off—

½-acre it will take 147½ feet each way.
⅓-acre it will take 120½ feet each way.
¼-acre it will take 104⅜ feet each way.
⅛-acre it will take 73¾ feet each way.

DRYING APPLES FOR HOUSEHOLD USES.

Discussing the drying of fruit at recent meetings of one or two branches of the Agricultural Bureau, the Assistant Fruit Expert remarked that apples had the recommendation that almost any mid-season or late variety would produce a satisfactory dried product (says the writer of the "Weekly Notes," issued by the New South Wales Department of Agriculture). In the cases of the stone fruits, only certain varieties were really suitable, while for dried apples the choice could be wider, although varieties like Granny Smith, Stone Pippin, London Pippin, and Dunn's Favourite, produced a dried article of better quality. Moreover, while with stone fruit only good specimens would give a satisfactory result, in the case of apples, any sound rejects could be used, so that the process was one way of using a by-product that would otherwise be wasted.

The apples should be peeled and cored, then sliced, and dropped into a weak brine—about as salty as soup. They must not be left longer in this than 20 minutes, or they become too salty, but must be transferred to the sulphuring chamber before being evaporated. Where the quantity that is being handled is small (such as for a household's own use, or little more), the sulphuring can be carried out by using a large packing-case, wide enough to cover the trays, and high enough to allow several trays to be stacked one above another, so that they can all be treated at one time. A level piece of ground should be chosen, and a small hole dug, in which to place the vessel containing the sulphur. The stacked trays should be placed over the hole, the sulphur pot put in the hole, and lit, and the whole covered with the packing-case, which should have been well lined with paper, to prevent the fumes from escaping too rapidly. To fumigate a chamber of 200 cubic feet (say, 5 ft. by 5ft. by 8 ft.), 1 lb. of sulphur may be considered sufficient, and from that may be calculated the small quantity required for such a small cubic space as that of an ordinary packing-case. The sulphuring should generally take about twenty minutes, but if the peeled apples are not put into brine a little longer—say thirty minutes—will be required.

From the sulphur chamber, the trays should be removed to the drying green or the evaporator, from which the fruit should be transferred to sweat boxes or sacks, in which the whole sample can even up—a very necessary part of the process with apples.—"Town and Country."

Answers to Correspondents.

CHILLI WINE.

MRS. BAXTER—

Take 2 quarts of water, 10 small bruised chillies, ¼ ounce of citric acid, 2 tablespoonsful of white sugar (burnt black), 1 teaspoonful essence of lemon, and 3 lb. of sugar. Pour boiling water on the ingredients; colour with the burnt sugar; then, when cool, bottle and cork well.

Another method is to take 1 lb. of brown sugar, 2 quarts of water, 8 small chillies, ¼ ounce of citric acid, a teaspoonful of sugar (burnt black), and a teaspoonful of essence of lemon. Pour boiling water on the chillies, acid, and sugar. When cold, mix the burnt sugar to colour the mixture; add the essence; strain when cold and bottle.

TO BANISH FLIES.

C. BUTLER, Bentley Park Farm, Edmonton, Cairns—

It has always been a troublesome question what to do with flies in the summer. Here is the best method of destroying them that we know of:—

Take half a teaspoonful of black pepper in powder form, one teaspoonful of brown sugar, and one teaspoonful of cream. Mix them well together, and place in the room on a plate when the flies are troublesome, and they will soon disappear. Cold green tea made very strong and sweetened with sugar will also, when set in a room in saucers, attract flies and destroy them. For flies in the stable or dairy, French entomologists have found that flies have a great objection to the colour "blue," and if tenements infested with flies are washed with a blue, instead of a white wash, flies will desert the place. By using the following formula a farmer who had 170 cows in different sheds, where they were pestered with flies, observed that in one shed, the walls of which were blue, the cows were not worried. He therefore added a blue colour to the lime with which he washed the walls of his buildings, and from that time the flies deserted them. The formula he used for the wash was: To 20 gallons of water add 10 lb. of slaked lime and 1 lb. of ultramarine blue. The washing was done twice during the summer. Any remedy, especially such a simple one, is well worth trying in districts where the flies in summer in Queensland are such a serious pest.

Some flies lay eggs; others, such as blow flies, reproduce live maggots. House flies lay eggs in house rubbish, rags, &c.; also in manure heaps.

INVASION OF INSECTS ATTRACTED BY LIGHT.

Mr. Hy. Tryon, Government Entomologist, to whom your specimens of insects were submitted, has reported or them as follows:—

"The insects submitted are examples of a small and common fly belonging to the genus *Psychoda*, one of the so-called "Owl Midges." They breed in organic matter and not infrequently occur in enormous numbers, and, as they are attracted to light, are not uncommonly seen—small as they are. Again, individuals will display their very active movements in window-panes at times. Under ordinary circumstances, their wings are characteristically clothed with hairs, but the specimens submitted had almost entirely lost this endowment, evidently having been subject to abrasion. This, and the light attractiveness alluded to, as well as the circumstances under which they were met with, inclines me to conclude that were it not for your lamp their presence would not have claimed your attention. Having one by one come under its influence and battered their wings against the lamp-globe, they fell on to the table until they were sufficiently numerous to claim attention, their presence on daylight supervening being especially evident.

"Entomologists have reared *Psychodids* from eggs laid on dead insects. In this may be found the explanation of their having jumped on to the bodies of mosquitoes, occurring on the tablecloth where they happened to be, and present there also, under circumstances identical with those that brought them thither.

"A closely related *Psychodid* may be found settled on the backs of badly groomed horses here, and was formerly pointed out to me, in error, as the cause of the mange that affected them.

"The family includes, however, some narrower-winged kinds than are the true *Psychodas*. These, unlike the latter, are undoubtedly blood suckers, and named *Phlebotamus* accordingly. Of these, more than one has been inculpated as the intermediary pest of Maltese fever."

HENRY TRYON.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1919.

Article.		APRIL.
		Prices.
Bacon	lb.	11½d.
Barley	bush.	...
Bran	ton	£7 5s.
Broom Millet	"	£50 to £80
Broom Millet (Sydney price)	"	£50 to £75
Butter (First Grade)	cwt.	177s. 4d.
Chaff, Mixed	ton	£9 to £11
Chaff, Oaten	"	£9 to £9 15s.
Chaff, Lucerne	"	£11 6s. to £11 12s.
Chaff, Wheaten	"	£7 5s. to £8 15s.
Cheese	lb.	11d. to 1s. 4½d.
Flour	ton	£12
Hams	lb.	1s. 3d. to 1s. 4d.
Hay, Lucerne	ton	£8
Hay, Oaten	"	...
Hay, Wheaten	"	...
Honey	lb.	4d. to 5d.
Maize	bush.	8s. 6d. to 8s. 8d.
Oats (Seed)	"	5s. 6d.
Onions	ton	£16 to £18
Peanuts	lb.	5d. to 7d.
Pollard	ton	£8 5s.
Potatoes	"	£18 10s. to £21 10s.
Potatoes (Sweet)	cwt.	12s. 4d. to 12s. 6d.
Pumpkins (Cattle)	ton	£11 10s. to £13 10s.
Eggs	doz.	1s. 9d. to 2s. 9d.
Fowls	per pair	4s. to 8s. 6d.
Ducks, English	"	3s. to 3s. 10d.
Ducks, Muscovy	"	4s. to 7s. 6d.
Geese	"	5s. 5d. to 8s.
Turkeys (Hens)	"	8s. 6d. to 14s.
Turkeys (Gobblers)	"	25s. to 30s.
Wheat (Milling)	bush.	...

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	3s. to 6s.
Beetroot, per dozen bundles	1s. 6d. to 2s.
Cabbages, per dozen	2s. 9d. to 10s. 9d.
Carrots, per dozen bunches	1s. 6d. to 2s.
Cucumbers, per dozen	2s. to 3s. 6d.
Lettuce, per dozen	1s. to 6s.
Marrows, per dozen	2s. 6d. to 6s.
Parsnips, per dozen bunches	...
Peas, per sugar-bag	10s. to 14s.
Potatoes (Sweet), per sugar-bag	5s. 6d. to 7s.
Pumpkins (table), per cwt.	6s. to 12s.
Tomatoes, per quarter-case	3s. to 4s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Queensland), per case	18s. to 22s.
Bananas (Tweed River), per case	19s. to 23s.
Bananas (Fiji), per bunch	...
Bananas (G.M.), per bunch	...
Bananas (G.M.), per case	...
Lemons, per bushel-case	18s. to 24s.
Passion Fruit (Queensland), per case	...
Pears, per bushel-case	3s. to 4s.
Pineapples (Queens), per double case	...
Pineapples (Ripleys), per case	12s. to 15s.
Pineapples (Common), per case	5s. to 6s.
Tomatoes, per half-case	5s. to 9s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	5s. to 6s. 6d.
Apples, Eating (Imported), per bushel-case	7s. to 11s.
Apples, Cooking, per bushel-case	9s. to 12s.
Bananas (Cavendish), per dozen	2¾d. to 6½d.
Bananas (Sugar), per dozen	2d. to 6d.
Citrons, per hundredweight	7s. to 8s.
Cocoanuts, per sack	15s. to 25s.
Lemons (Lisbon), per quarter-case	3s. to 4s. 6d.
Mandarins, per case	9s. to 10s.
Oranges, per case	7s. to 9s.
Passion Fruit, per quarter-case	7s. to 10s.
Peaches, per half bushel-case	5s. to 8s.
Peanuts, per lb.	5d. to 7d.
Pears, per quarter-case	10s. to 18s.
Persimmons, per quarter-case	5s. to 6s. 6d.
Piemelons, per dozen	1s. to 3s.
Pineapples (Ripley), per dozen	3s. 6d. to 4s.
Pineapples (Rough), per dozen	3s. 6d.
Pineapples (Smooth), per dozen	2s. 6d.
Plums, per case	9s. to 14s.
Rockmelons, per dozen	...
Sugar-melons, per dozen	...
Tomatoes, per quarter-case (ripe)	...
Tomatoes, per quarter-case (green)	...

TOP PRICES, ENOGGERA YARDS, MARCH, 1919.

Animal.	MARCH. Prices.
Bullocks	£20 10s. to £25 2s. 6d.
Bullocks (Single)	...
Cows	£15 to £17 5s.
Merino Wethers	46s.
Crossbred Wethers	46s.
Merino Ewes	30s.
Crossbred Ewes	36s. 3d.
Lambs	37s. 6d.
Pigs (Porkers)	47s.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1919.	Mar., 1918.
North Coast.	In.		In.	In.
Atherton	8·78	18	5·99	9·88
Cairns	18·47	37	6·23	11·18
Cardwell	16·86	47	3·82	26·71
Cooktown	15·15	43	8·63	9·60
Herberton	8·39	32	2·71	7·39
Ingham	16·98	27	5·62	28·95
Innisfail	25·95	38	13·99	24·04
Mossman	20·03	11	5·11	10·49
Townsville	8·24	48	1·95	2·54
Central Coast.				
Ayr	7·72	32	3·03	0·48
Bowen	6·04	48	3·06	0·77
Charters Towers ...	3·72	37	1·80	2·28
Mackay	12·67	18	4·45	7·26
Proserpine	12·66	16	6·61	5·38
St. Lawrence ...	6·29	48	2·41	1·40
South Coast.				
Biggenden	4·55	20	2·71	2·80
Bundaberg	5·73	36	5·37	3·08
Brisbane	5·92	68	6·02	3·05
Childers	5·38	24	4·16	2·43
Crohamhurst ...	12·30	25	11·25	10·79
Esk	4·96	32	6·29	1·82
Gayndah	3·27	48	4·94	1·65
Gympie	6·43	49	5·60	3·22
Glasshouse M'tains	9·16	11	9·29	8·59
Kilkivan	4·15	40	4·25	1·35
Maryborough ...	6·55	48	4·97	4·04

Divisions and Stations	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1919.	Mar., 1918.
South Coast—continued:	In.		In.	In.
Nambour	9·89	23	8·87	10·13
Nanango	3·38	37	4·93	2·24
Rockhampton ...	5·28	32	3·13	1 80
Woodford	8·47	32	5·92	6·15
Darling Downs.				
Dalby	2·87	49	1·80	0·69
Emu Vale	2·68	23	5·62	0·42
Jimbour	2·71	31	3·34	0·23
Miles	2·90	34	1·61	0·45
Stanthorpe ...	2·75	46	6·55	0·35
Toowoomba ...	3·96	47	5·25	1·12
Warwick	2·89	32	5·31	0·26
Maranoa.				
Roma	2·95	45	1·20	0·24
State Farms, &c.				
Bungeworgorai ...	2 01	5	1·02	0 52
Gatton College ...	3·54	20	5·35	0·54
Gindie	3·17	20	0·15	0·65
Hermitage ...	2·66	13	5·65	0·57
Kairi	5·57	5	3·36	...
Sugar Experiment Station, Mackay	12·18	22	1·92	7·14
Warren	2·95	5	0·87	2·12

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be checked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August or, at the earliest, in warm early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; also, horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without prunning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when Spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs

should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed-bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frost, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of staggering top-heavy trees; and, second, in the case of trees that are going off in the size and qality of their fruit. Where peaches, apricots, plums, or nectrarines are only making very little growth, and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and staggering, and bear a large quantity of small-size fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchard or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

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Agriculture.

IRRIGATION.

ECONOMIC AND PRACTICAL METHODS, No. 5.

BY P. MAHONEY.

CULTIVATION.

The last, but not least, of important factors in making a success of irrigation, is cultivation, which is by far the most important of all the treatments meted out to the soil; for without thorough and systematic cultivation the full benefits of the irrigation waters cannot be attained, because it tends to make the actual cost of applying the water greater than if a thorough tilth is maintained, for it takes longer to effect a thorough watering when the ground is not properly cultivated, and longer for the water to soak into the ground when it is in this state, and there is a likelihood of an accumulation of surplus water on the headlands through having to run the water for a longer period than when good cultivation is maintained. With a deep and thorough cultivation, the water soaks in very rapidly, thus causing a great saving of time and water when irrigating. Another important point to be borne in mind is that, unless a deep and thorough cultivation is maintained, some soils are liable to run together through the influence of the irrigation waters, and become compact. Unless this is broken and disturbed, the evaporation will be great and rapid, necessitating a call for more water which, in all probability, will be detrimental to the plant, for under such circumstances it is difficult to keep an even supply of moisture, and over-abundance followed by a scarcity is not conducible to success. Deep cultivation should follow in the wake of irrigation.

Cultivation is much cheaper than the actual applying of the water, and is the only minimiser of applications, and assurance of success. If carried out thoroughly, it prevents evaporation of moisture from the soil, thus prolonging the effect of the waterings, at a less expense, with much more indirect benefits than a watering, as it puts the soil in a better condition for receiving the water, thus shortening the time in irrigating, and avoiding any likely surplus, as the soil will absorb it freely. Other great benefits which are derived from cultivating are the sweetening and aerating of the soil, which are indispensable for success, since such action upon the soil by the sun and air liberates plant food in large quantities, which otherwise would never be available for assimilation by the plant, thus gradually increasing the assurance of successful crops, for if plant food is kept in abundance, the crops are not so long in the ground, or growing, thus minimising any likelihood of loss through

adverse weather conditions and parasites, as the latter are less effective on a vigorous, healthy plant, hence there is a big chance of it outgrowing the pest.

The cultivator also plays another very important part in keeping down moisture-robbers in the shape of weeds and grass, which are capable of depriving the plants of enormous quantities of moisture. They also harbour insect pests, &c. Lines specially manufactured for weed-killing are the most effective, if such work is carried out on a hot, sunny day, for when weeds have their roots severed in such weather they wither and die very quickly.

If possible, plants should be set out so as to admit of cross-cultivation, which enables the best results to be derived from artificial watering, for enormous benefits are derived from same in the shape of moisture conservation and hoe work, as it practically disturbs all the surface soil. It is surprising to note the quality and quantity of crops that can be produced with a small amount of water, when given at the most appropriate times.

To make surplus water take the place of cultivation is suicidal for the reasons previously mentioned.

Cultivation is so closely allied to successful irrigation that it is practically a part of it.

[CONCLUDED.]

LUCERNE CULTIVATION.

In order to maintain lucerne fields in full profit, the application of liberal dressings of fertilisers is necessary. The Department of Agriculture, Victoria, has been making useful tests. These were conducted during a period of three years, and the results were made available recently. Lucerne sown without fertilisers gave a yield of 11 tons 8 cwt. in the three years, an average yield of 3 tons 16 cwt. of hay per annum. Lime applied at the rate of 1 ton an acre, or its equivalent in the form of ground limestone, gave increases of 21 cwt. and 32 cwt., which were sufficient to pay for the cost of the manure, and yield a net profit of 6s. 3d. and 18s. 6d. per acre respectively. The addition of phosphates, whether in the form of basic slag, super., or bonedust, effected increases ranging from 49 cwt. to 76 cwt., all of which were sufficient to pay for the cost of the manure, and yield a profit of from 29s. to £6 16s. 3d. an acre. Superphosphate applied at the rate of 2 cwt. per acre each alternate year was the most profitable of all the artificial fertilisers used in the tests. Nitrogenous manures applied in combination with phosphates and lime enabled the maximum crops to be raised, the increases over the unfertilised plots ranging from 4 tons 4 cwt. to 4 tons 7½ cwt. Though the gross returns were much higher than all other plots, the net profit from these dressings was not as high as that from superphosphate alone. The results served to show that lucerne yields could only be maintained in full profit by the application of liberal dressings of fertiliser. Analyses conducted in the laboratory showed that a good crop of lucerne hay at Werribee removed from the soil in one year enough nitrogen to supply the needs of twelve average wheat crops, and phosphoric acid sufficient for the needs of seven average wheat crops.—"Producers' Agency."

FLAX-GROWING.

In view of the guarantee of the Commonwealth Government for unthreshed flax of specified standard having been increased from £5 to £6 per ton to growers in 1919, the Commonwealth flax industry committee anticipates a considerable extension in the cultivation of this crop. The price of seed to the grower has been fixed by the committee at £25 a ton, or 12s. 6d. a bushel, and the rate of sowing recommended is from 60 lb. to 65 lb. to the acre. The committee wishes to point out that fibre flax requires a rainfall of not less than 26 in., with suitable incidence, and the land to be sown must be good and clean. One of the conditions to ensure full payment of the guaranteed price is the freedom of the crop from noxious weeds or an excess of undergrowth. Should any body of farmers in a suitable district contemplate the cultivation of flax under the Government guarantee, the flax committee would be glad to arrange for one of its members to visit the district. Ordinarily the cultivation of 400 acres in the same district would be justification for the erection of a flax mill. Co-operative companies of growers have been formed

at Buln Buln and Dalmore, Victoria, for the erection of mills to treat the crops, and there is every probability of these ventures proving successful. With regard to the 1918 flax crop, the Commonwealth Government, on the committee's recommendation, has agreed that any surplus, after milling and other expenses have been paid, shall be divided among the growers, and it is anticipated that this surplus will be considerable.—Exchange.

THE PRICE OF BROOM MILLET.

Reports from Victoria show that in certain districts the broom millet crop has recovered remarkably as the result of recent rains, and harvesting has now commenced. High prices are anticipated; but it has been pointed out to the growers that it is quite possible, even in their own interests, that the price may be fixed too high. There is a scarcity of broom millet throughout the world, and, as frequently happens in such cases, manufacturers are resorting to substitutes. One of these is a material known as bassine, which is imported from Africa and India, and which it is said can be landed in Melbourne at £30 per ton or less. The commercial representative of the Royal Victorian Institute for the Blind stated in a newspaper interview that bassine makes up into good broom and is more durable than millet, though less flexible. Last year, growers in the Wangaratta district of Victoria were paid up to £85 per ton for millet. A high-priced millet meant, in the end, a high-priced broom, which eventually would be regarded by the consumer as a luxury, and lead to the use of the cheaper substitute. Once the bassine broom got a footing in this country the people would not pay for the higher-priced article, and the millet growing industry would be killed. Growers were asking from £60 to £110 per ton for this season's millet, and some even more; but it was thought that £60 was about a fair thing, and even a little higher might be obtained, but growers are warned against the danger of insisting on too high a price.—"Farmers' Gazette."

EXPERIMENTS WITH LINSEED IN 1918 IN NEW SOUTH WALES AND QUEENSLAND.

In 1907 experiments were made at the Biggenden State Farm in growing linseed for seed and straw by the then manager, Mr. D. Macpherson, and an accurate account of the conditions under which the crop was grown and of the results was kept, which led him to the conclusion that anyone having the necessary implements for handling wheat could also grow flax, and that so long as the market value of linseed did not go below that of wheat would receive a better return per acre, even if the seed only were marketed, owing to the more certain yield from the flax.

If we take into consideration the value of the fibre, and this is really the main product of the plant (estimated in pre-war time at £11 per acre), it must be admitted that there is every probability of the crop being a paying one. Since the war began, the prices of all commercial fibres rose to very high figures, and the price of linseed to-day in London is quoted at £29-£30 per ton.

Another consideration, and one which should have considerable weight with us, is that the crop is less dependent on climatic conditions than any of the cereals. Should the season be a wet one, it is probable that the crop of seed will ripen unevenly, and, in this way, a proportion of seed may be lost; but, even so, the yield of seed will still be a creditable one, and the crop of fibre will be extra heavy. If, on the other hand, dry weather should be persistent, neither the seed nor the fibre will be any the worse for eight or ten weeks of comparative dry weather before cutting. Again, flax likes a warm free soil; and as the soil on the Biggenden State Farm is very stiff and heavy, it is certain that the results there obtained could be greatly improved on in a lighter soil. Those results were 27 bushels of seed (60 lb. per bushel) per acre, and nearly 32 cwt. of straw.

IN NEW SOUTH WALES

trials were conducted by the Department of Agriculture at several of the experiment farms and on private properties in various parts of the State—in all, at twenty-three centres.

Owing to the unfavourable spring, all the plots, with the exception of five, were utter failures, while the yield in the others ranged from 180 to 252 lb. per acre.

The season in all cases was adverse, as the rainfall in almost every instance was much below the average. In some of the districts the total rainfall during the growing period was fairly good, but the spring proved abnormally dry. This had a serious effect on the linseed, whereas wheat, despite the hard conditions, returned fair to good yields.

Mr. H. E. McDonald, Chief Inspector, who superintended the New South Wales trials, adds to the above information (published in the March issue of "The Agricultural Gazette" of New South Wales) a table showing the yield of linseed as compared with other crops, as follows:—

Name of Experimenter.	Yield of Linseed per Acre.	Height of Linseed.	Yield of Other Crops.
	Lb.	In.	Bus. lb.
H. G M. Thackeray, Wootona, Young	188	12	41 3 Ruakura Oats 25 49 Yandilla King Wheat
H. C. Lowe, Dubbo	240	15	Not given
J. T Maunder, Pallancallawa ..	252	Not given	10 40 Hard Federation
W. T Annison, Parkes	180	12	Not given
R. O. Eulenstein, Gracevale, Henty	Complete failure due to dry spring	..	25 0 Hard Federation
Cowra Experiment Farm	219	12-18	25 0 Yandilla King 24 0 Hard Federation
Wagga Experiment Farm	Nil	6-9	19 40 Yandilla King
Bathurst Experiment Farm.. ..	Nil	6-9	19 40 Hard Federation Yield not yet available

For fibre purposes, the linseed practically failed in all cases, as the height in no case exceeded 18 inches, and ranged down to 4 inches.

FLAX-GROWING IN CANADA.

Turning to the progress of the production of linseed and flax in Canada, we find the following informative paper on the subject in the "Agricultural Gazette of Canada" in the issue of that journal for June, 1918. The concluding paragraph applies as much to the establishment of the industry in Queensland as it apparently does in the case of Canada:—

"In the House of Commons on 29th April, the member for East Middlesex introduced a motion having for its object the increased cultivation of flax in Canada. Dealing with the subject, after the member for East Middlesex had explained his motion, the Honourable the Minister of Agriculture said in regard thereto—

"' There is no doubt whatever that our soil and climate are admirably adapted to the growing of flax for fibre purposes. That has been proven by years of successful growing in certain localities in which in the earlier days of the country's development the settlers found it necessary to grow flax in order to supply themselves with a good deal of the clothing they required. Impressed with the importance of the industry in Canada, the Department of Agriculture several years ago undertook certain experimental work in respect to it. That experimental work covered practically the whole development of the industry from the growing of the flax to the manufacture into twines. In carrying on this work the Department have grown experimental plots of flax in practically all of the experimental farms and stations in Eastern Canada. They have found that it can be grown very successfully, and I believe that the records show that the Gaspe Peninsula produces perhaps the best quality of fibre grown in Canada. Flax has also been grown in Western Canada. It cannot, however, be grown so successfully there for fibre purposes; the climate appears somewhat against it.

"' The experimental farms have carried the work further. They have, on a small scale, quite an up-to-date set of machinery for carrying on the various operations of preparing fibre from the straw. In that way we are endeavouring to ascertain—first, the district from which the best fibre can be secured; and, second, the relative cost of turning it into the finished article in each district. That work will be of great advantage to the farmers of Canada who will be growing this flax later on.

"' That the minds of our farmers have been turned to the growth of this plant for fibre purposes is evidenced by the fact that the acreage planted for fibre purposes is steadily increasing. In Western Canada we have grown flax in quite a large way for seed. The flax crop of Western Canada has run in yield of bushels from fifteen to twenty million per annum, and the results have been very satisfactory.

"' Experiments have for several years been carried on with the ripened straw that results after threshing out the seed. This straw is ripened, and it has never been considered of any practical value for fibre purposes. Experiments, however,

have proven beyond any question of doubt that it can be converted into twines. I have in my office several samples of twine that have been manufactured in the city of Regina from fibre taken from flax straw. The product varies from fine hard twine, quite suitable for sewing harness and that sort of work, to coarser twine suitable for replacing ordinary binder-twine.

"'Last year the crop of flax straw in Western Canada amounted to about 1,500,000 tons. Experiments have shown that each ton of flax straw will produce 270 lb. of twine in its various forms. If all that flax straw were converted into twine, it would produce something over 300,000,000 lb. of twine. Canada annually uses something like 60,000,000 lb. of binder-twine. Our source of supply is from two countries—the Philippine Islands, and the province of Yucatan in Mexico; and if those sources of supply for the raw material, the manila, and the sisal were cut off, it would leave the farmers of Canada, particularly those of Western Canada, where they are engaged in grain growing on such a large scale, in a bad position. Consequently it is a matter of the very greatest importance to consider how this at present wasted material can be utilised to ensure an adequate supply of twine to bind our crops. And if we can convert waste material into useful product, we are simply getting that much further ahead in an economic way. That phase of the question, in my judgment, is one of very great importance.

"'If we survey the whole field again we shall find that probably the successful growing of flax for fibre purposes in Canada depends upon the cheapness of the labour we can secure. If we can replace manual labour by mechanical power, by the discovery and development of machines that will pull the flax, we certainly have all the natural facilities for a splendid development of this industry.'"

NEGLECTED INDUSTRIES.

CASTOR OIL SEEDS.

During the late war the only lubricant used in the motors of aeroplanes was, and is to-day, castor oil.

The castor oil plant, as most people in Queensland know, grows wild or semi-wild in most parts of the State, but, unlike prickly-pear, sida retusa, nut-grass, and other plant pests, is easily got rid of. As a drought resister it can stand very dry weather, but if this continues too long the yield of seed is much reduced.

There are several varieties of the plant, and from an article on the subject in the "Journal of the Jamaica Agricultural Society" (Vol. xxi., No. 12) advocating its cultivation on a commercial basis, the varieties of seed are given as the small and large grey, which are the most common, but better varieties to grow on a commercial scale are the brown, the white, and the black seeds. During and since the war the demand for lubricants has increased considerably.

A correspondent of the journal mentioned wrote as follows on the subject:—"As everybody knows, mixed with mutton fat, castor oil remains unsurpassed as a lubricant, and the Germans had to resort to the use of heavy petrols mixed with animal, and even human, fat.

"The variety *Palma Christi* (*Ricinus communis*) is an annual plant in temperate countries, but in tropical countries, where its growth attains up to 15 feet in height, it is a vivacious, and even a perennial plant. Two varieties of *Palma Christi* seem to be found in Trinadad, both yielding a great quantity of oil; one producing greyish seed marked with dark stripes, and another giving violet or dark blue seeds. There is also a variety producing much larger seeds.

"One may depend," says the writer, "on a crop of 325 to 400 kilos. (882 lb.) of seeds to the acre, according to the nature of the land and the variety of the plant. When freed from their legument, the seeds of *Palma Christi* yield up to 65 per cent. of oil; but if ground and pressed, while warm, without cleaning, a good percentage of oil is retained by the cake, and the yield is only from 35 to 37 per cent.

"*Palma Christi* leaves are considered an excellent fodder for milch cows, as the oilcake contains as much as 5 per cent. of nitrogen; it is a first-class fertiliser, although, on account of its laxative properties, it cannot be recommended as stock feed.

"Before the war the price of *Palma Christi* seed fluctuated between 60 and 70 dollars (£12 to £14) per ton, but since then it has gone much higher."

Caster oil, in 1918, was quoted in London at £80 per ton.

In the following notes on the castor oil plant, Mr. D. Jones gives a digest of his investigations into the habits of the plant, its cultivation, &c.:—

THE CASTOR OIL PLANT *(RICINUS COMMUNIS)* IN QUEENSLAND.

By DANIEL JONES.

The Genesis of the Industry.

It is somewhat difficult at this lapse of time to definitely ascertain to whom may be credited the distinction of attempting the establishment of this pursuit in this State.

Some forty years since, Mr. James Foote, then the representative of Ipswich in the State Parliament, essayed to deal in the article. He made some progress in respect to testing the oil values, and, I believe, purchased a quantity, paying the handsome price of 3d. per lb. for the castor beans.

This, with many of our old-time experiments in relation to the building up of what should be staple industries, encountered the apathy of the legislative authorities, who failed to appreciate the value of creating a home industry so vital to the needs of a growing State, more particularly as the castor plant thrives in Queensland to such an extent as to incur (needlessly) the ban of local authorities, who, without reason, class this useful plant as a noxious weed in many localities.

A due appreciation of the uses of this plant would speedily correct this false impression, and by this time we ought to have an export trade, both in beans as well as in oils, for medical and lubricating purposes.

The late Mr. Lewis A. Bernays, in his useful work "Cultural Industries for Queensland," mentions the excellent work done by Dr. Joseph Bancroft and Mr. Behrens, of Brisbane, who in those early days interested themselves in an attempt to place the industry on a commercial footing.

The Habitat of the Plant

in Queensland is extensive, indicating that it has a congenial home in this country. The writer has gathered excellent examples of beans out West in the Mitchell district, also in the Central district at Longreach, north of Townsville, and at Charters Towers, and has observed the plant thriving nearly as far inland as Hughenden. It will be noted that from the sea-coast to the far West the castor bean has a habitat in which it thrives. Judging by its behaviour under the different climatic conditions prevailing in these widely-spread localities, differing as they do in seasonal and climatic conditions, it will be seen that the plant is most adaptable to our soil and climate, and hence ought to become one of the most prized of any of our rural industries.

Pests Affecting the Plant

are rarely met with when growing volunteer in its uncultivated state. It is not always so when introducing new sorts into fresh localities, as frequently a new enemy finds out the plant and makes it a host, rarely, however, so as to entirely jeopardise a crop. In its wild state comparatively few insects attack the plant, due in all probability to its being acclimated and thus largely immune to insect attack. New varieties when introduced, however, fall a prey to insect attack, principally from *Dichocrocis punctiferalis*, said to be identical with the Peach Moth, which on young plants ravages the stem and capsule to the injury of the bean in particular. The plant being of a very hardy type will, despite severe attack, if growing in congenial soil, hold out well, and, as age increases, become more immune to parasitical injury.

If the soil is badly drained, an unhealthy condition of the shrub ensues, and at times it becomes liable to infestation by a species of scale insect, one of the Aspidiotis, not, I am pleased to learn, the one so disastrous to fruit trees.

I have had some shrubs last season seriously injured by this scale. The plant, however, is able to resist most insect attacks if grown in congenial soil.

Slugs in and around Cairns, I am informed, do some damage to the tender plants soon after germination.

A leaf-eating insect, *Thyas Melicerte*, Drury, which in this State affects mangroves, abutilon, and castor oil plant, feeding on all of which, do some damage. On an experimental plot near Brisbane this insect has this season stripped a few of the castor plants entirely of their foliage. It pupates on the plant, usually selecting a leaf, which it curls, and draws a fine web around itself.

The Cultivation of the Castor Bean

calls for no great attention, for once the shrub has obtained a few weeks' growth it then, by virtue of its robust nature and hardihood, will endure a degree of neglect in tillage which other crops would not stand.

The land should be prepared much the same as for cotton or maize—ploughing about 4 in. to 5 in. deep, and harrowing to as fine a tilth as may be possible.

The seed should be sown about 1½ in. to 2 in. deep, two or three beans being dropped together, but not so close as to interfere when thinning the plants later on to one in a space. The quantity of seed required for an acre can be estimated on the basis of that of the large-sized bean, such as the Eureka, of which about twenty-eight beans make an ounce in weight. The smaller Red variety weigh about fifty-five beans to an ounce.

The Eureka type being a free-growing shrub, often reaching the height of 15 ft. in the second year of growth, with an equal spread of branches if in fertile soil, will require to be spaced about 12 ft. apart. The Red variety does not grow so big, but at times attains a height of 10 ft. to 12 ft. in its second year. From this it will be noted that the number of plants to the acre will not be large. If spaced 10 ft. by 10 ft., there will be 435 to the acre. Sowing time will be the earlist opportunity in the spring, so as to enable the plants to forge ahead before much weed growth is in evidence. It is hardly possible to safely till the ground between the plants once they have attained the height of 5 ft. or 6 ft., which they do in this climate within five months or so.

Judging by experimental plots near Brisbane, the only attention necessary is that the weed growth be cut down and the material spread around the trunks of the plants as mulch. This is practically all that is done on a couple of plots on which this crop was being tested. The plants are at present showing remarkable vigour, the seed being sown but six months since, and many of the shrubs are fully 10 ft. in height, with a corresponding spread.

Judging by the manner in which this plant grows in waste places, there is every likelihood of it lending itself to a new departure in method of tillage, particularly in districts not subject to a great degree of frost.

In many places in North Queensland I have observed castor plants sown so as to protect fowlhouses, as break winds, and shade for the not uncommon tin humpy of the pioneer settler.

It is quite possible to make a plantation without ploughing, and simply planting the seed in holes prepared as circumstances allow. In this way many a back yard or unused allotment might be utilised to profit. The unique foliage of the castor bean lends charm to any plot in which it thrives. Few of our ornamental plants show a more brilliant colouring than does the bright red spike of the Red variety. The larger and perhaps handsomer Eureka type shows in its light-green foliage and extensive leaf system perhaps the most attractive appearance of all our arboraceous plants.

Except in regions of low frost temperatures, the foliage is a constant evergreen, and where frost attack is severe the plants are only a couple of months or so before they regain their foliage. After the first spikes appear no field tillage is recommended, as the implements employed may do damage to the plant.

The Yield of Castor Beans

will materially depend on the variety raised and the adaptability of the soil and climate. The writer has on occasions planted this crop on plots where the resulting growth was a complete failure.

On poor, sandy soils the plant fails to show that exuberance of growth in foliage and crop that it invariably does in a suitable soil.

The small Indian or Javanese sorts are not nearly so prolific in bearing as the larger Red or variegated Eureka type, though they mature earlier.

The American yield is set down as ranging from 15 to 25 bushels of 46 lb. to the acre in the Northern States, while in the South the yield is said to range from 35 to 40 bushels. Taking the highest estimate as the yield, it amounts to slightly over 1,800 lb. of beans to the acre. As there are at present no dependable data as to the possible yield in Queensland on a plantation scale, estimates must be made on such tests as have been carried out on minor plots.

My experiments in Brisbane and its suburbs have been confined chiefly to the Eureka bean, and tests carried on during the last eight years indicate that a very profitable industry can be created by handling this variety.

While it is freely admitted that a small plot of castor plants grown under ordinary conditions might not accurately indicate the yield of a more extended sowing, nevertheless, the data respecting the crop of a number of plants grown in different years, and under changing seasonal conditions, ought to show to what extent profits might arise from tillage under plantation conditions.

In the 1914 season one of my Eureka shrubs yielded 16 lb. weight of merchantable castor beans; and in 1917, six small plants, growing in unsuitable soil, gave a return of over 3 lb. of beans per plant.

The 1914 shrubs, which grew to a height of fully 15 ft., died in 1918, yielding in that season 9 lb. of beans from each tree. Corresponding returns have been realised from plants grown by friends in the suburbs to whom I furnished seed.

These gave this yield while attacked at times to a serious extent by the *Dichrococis* caterpillar, and to some extent were affected by the drought then fatally in evidence amongst other crops.

From these data, carefully collected, it may be assumed that it should be possible to raise at least ½ to ¾ of a ton of castor beans per acre of the Eureka variety without extra care or attention. My plants received no tillage whatever from the period of sowing until the last crop was taken off. The Red varieties will not in all probability give an equal return, but half a ton and upward per acre may be a reasonable estimate.

The Yield of Oil and Its Value

has been carefully investigated by the Federal Institute of Science and Industry, and very valuable data have been obtained from this source. Our Queensland species of castor have uniformly reached a fairly good analysis. Although in some instances the findings have not been identical in oil contents as furnished by the different laboratory tests, due, perhaps, to the age of the seed or mixing of several varieties may be accountable for any discrepancy arising, our beans show as good an oil content as any elsewhere produced. Near Melbourne the Bureau have established an experimental plot, on which they have collected some eighteen kinds, but it is not expected that the colder climate of Victoria will develop so high a class of bean as can be raised in the more congenial habitat such as it finds in this country.

The three highest analyses of Queensland beans so far tested relate to the Eureka variety, one analysis being given as 59 per cent. of oil content. A further test of the same bean resulted in a smaller analysis of oil content, due, perhaps, to the age of the seed supplied for the test. This is partly borne out by a later analysis which made the oil content 50 per cent. The several Red varieties collected at Roma and in the Lockyer district gave an oil content of 50 per cent. It is thus established that we have a good quality of bean to operate with if sufficient interest is taken in the subject.

Thus, a new industry, adaptable for family enterprise, and one requiring little capital of farming experience, is well within reach of all who entertain any idea of settling on the land.

The value of castor oil has been much enhanced by virtue of the fact that it is regarded as indispensable for aeroplane lubrication, having the unique merit of not freezing in high altitudes. This fact has increased the demand for the article, as well as materially enhancing the value of the oil.

It has been estimated that the demand for castor oil for present Commonwealth requirements will use up some 4,000 tons of castor bean annually, the bulk of which it is well within the ability of Queensland farmers to supply.

The present value of the bean in Melbourne is £20 per ton delivered in that city. From this it will be seen that a big and profitable industry can be inaugurated exclusively for our own advantage if taken actively in hand, not only to fill the Australian requirements, but when trade facilities are available in connection with factories to extract the oil, and there is no reason why a world market should not be within our ability to command.

The Harvesting of the Bean

is by no means a difficult one, particularly if growing the best shelling types. Our river bank variety of bean, though very small, has in this respect a great merit by reason of the fact that it is eminently tractive in the manner in which it sheds its bean. In some sorts the capsule is so rigid that the bean must be expelled by force,

and several machines are devised having this object in view. The small Red bean, as far as observed, is hard to thrash out. The Eureka, however, usually has the merit of shedding at least two beans from the capsule without requiring any mechanical effort, the one remaining bean, evidently true to a natural law, that of survival, declines to come out, and must be mechanically treated to draw it out of the pod.

The harvesting of the crop depends on the type of bean which is grown. A freely-shedding bean can be placed on a sheet or clean floor in the sun, when, as the capsules dry, the beans pop out at times to some distance from the base. If growing very refractory sorts, the harvesting must be done without regard to sun-drying, as in that case only by mechanical methods can the bean be separated from the pod.

The Advisory Council of Science and Industry, writing on this matter, quotes Mr. W. W. Stockberger, of the United States Department of Agriculture, as follows:—"During the past season several manufacturing firms have been working on the production of a castor bean threshing machine, but these firms have not been uniformly successful. Machines built by the Seminole Manufacturing Company, Jacksonville, Fla., and the Appomattox Iron Works, Petersburg, Va., have been used with satisfactory results. I am unable to state the price at which they would deliver the machines to you, but to-day am writing to these firms, telling them of your needs, and asking them to forward to you descriptions of the machines with prices."

One difficulty in relation to mechanical treatment of the bean will relate to the dimensions of the bean itself. Taking as an example the size of beans of the Eureka types, compared with the smaller kinds of not half the bulk, it may be a difficult matter to adjust the machines to treat various sorts unless the machine is expressly built to thresh beans of varying sizes. Any machines designed for Australian use ought to have an adjustment of roller so that any size bean can be put through without damage.

The small Indian sorts mature the first of the crop in about four months from sowing. In this time, however, but a minor part of the crop is in evidence. The spikes continue to develop until the cold weather or frost arrests further growth. The Red and Eureka sorts will not bear so early, and these furnish but a few spikes until about twelve months old. From thence onward the returns become greater until the shrub dies. It is said to live for ten or twelve years in favourable locations.

The field harvesting is simple. The worker, armed with a sharp knife, cuts off the mature spikes, throws them into a receptacle for transport to a barn or outhouse situated so that if required a sunning can be given the pods. By this means much of the crop can be got ready if free-shedding sorts. I found with Eureka beans that this was quite enough to bring the bean from the capsule if well exposed to the sun. I have at hand, however, for some months examples of the Red beans which show no appearance of self-shedding whatever, so recourse must be had to some form of mechanical threshing yet to be devised.

If working on mature trees, say, from 15 ft. to 20 ft. in height or more, a cutter much on the principle of that commonly used in orchard pruning will be of service. This will enable the worker to reach spikes growing some distance from the ground, and thus expedite the harvesting.

A commonly accepted idea is that the castor bean is harmful to stock. This has no foundation; in fact, the experience of several farmers that I have discussed the matter with indicate conclusively that the plant, although not usually relished by cattle, is useful in times of drought, as evidenced in my own observation in drought areas in the past few months. Mr. Percy Biddles, one of the most experienced farmers of the Burnett district, in a recent conversation, emphatically endorsed the idea that the castor plant is in no sense injurious to stock, basing his statement on observations of its effect on his own cattle that had a liking for the foliage, which they ate without any evil effects ensuing.

In India it is said that the ryot commonly uses it as cut fodder for his animals.

The bean, however, if eaten by stock, which are not prone to do so, would cause injury, but long observation of cattle grazing amongst castor plants does not show that there is any danger from this source. Poultry keepers, particularly in the North,

favour the plant as a shade and protection for poultry-houses. I have frequently asked the poultry owner if ever any ill-effects happened the fowls through eating the bean, and always have obtained a negative reply.

Children have been known to suffer from eating them, but rarely does this happen, though the opportunity to do so is often at hand.

The Value of Castor Bean Meal.

has recently been the subject of research work by the Imperial Institute of London, who, in a bulletin, indicate the result of experiments in utilising the meal for pig-feeding.

"An account is given of trials carried out by the Veterinary Department of the Board in order to determine whether the residue of castor beans, after the removal of the oil, can be used satisfactorily for feeding pigs, and, in particular, to ascertain whether the toxic properties of the residue, which are due to ricin, can be removed by submitting the material to a high temperature. The heating process was carried out by the manufacturers, and the temperature employed is not recorded. The pigs refused to eat the meal when merely mixed with water, or when mixed with treacle. When, however, the meal was given with house-wash of good quality, which had been boiled and mixed with other meals, a considerable amount was consumed with good results. In no case were any symptoms of poisoning observed."

There is a possible chance, judging by the foregoing experiment, if any earnest chemist could give the time to the experimental work on lines indicated, of discovering a method of eliminating the toxic properties from castor beans, so that, much on lines that have been so successful in handling copra, in converting what some time since was a malodorous fat into an edible commodity of immense value and use, may be achieved. Any chemist who can demonstrate a way to make the castor oil into an edible fat will earn the goodwill of our community and place the castor-growing industry in the first rank of Queensland products.

The pomace, or residual matter, after oil extraction, has a value as a high-class fertiliser. A local chemist estimates it to be worth at least £7 per ton, containing as it does a high percentage of nitrogen, phosphoric acid, and potash, materials badly wanted for our orchard operations.

If tariff advantages can be adjusted in favour of this industry, particularly in relation to the importation of the raw article, there is every reason to expect another valuable addition to our primary industries of a subtropical nature, and one that will materially assist to people the empty North.

The Domestic Uses of the Castor Plant

are well recognised in the home circle, and recourse is invariably made to the castor oil bottle for many juvenile and adult ailments. Medical science admits valuable curative properties in the leaf of the plant in the form of poultices in cases of tumours, especially for application in instances of female breast troubles.,

Some time since, while in a Western district a lady friend had considerable difficulty in obtaining castor leaves for this purpose, in order to carry out her physician's instructions.

Settlers can easily, by either utilising pressure or boiling the beans, procure enough castor oil for farm requirements in a very simple way. Application of sufficient pressure such as may often be obtained on a farm where baling of products is carried on, by arranging suitable receptacles for the seed and then expressing the oil. A method usually in vogue among Asiatics, is to crush the beans, tie them up in a bag and submit the material to a steady boil, skimming off the oil as it comes to the surface of the water. In this way oil can be got for farm needs either for lubrication or harness application. An English Trade Journal states that the stalk and leaves will make good paper pulp. The writer uses the kernel of a bean whenever the pocket knife wants oiling. A piece of kernel pressed into the joints of a knife, will oil the article in a cheap and satisfactory manner. It is said that poultry roosting in proximity to castor trees, will not become affected with vermin. A dubious merit is also claimed for this plant—viz., that it keeps mosquitoes away. As an ornamental pot plant, it has few that equal it in appearance, thriving under conditions in which other plants would fail. As a soil renovator, it has its claims for recognition in its ability to flourish in low-lying areas as is often seen in Brisbane which proves it to have a sanitary value not admitted by the authorities who proclaim it a noxious weed. A plant that lends beauty to waste places, draining, by transpiration, the wet stagnant soils, surely ought to have its merits recognised. It should be the duty of local authorities to at once remove the ban against the cultivation of so useful a plant, and do all they can to encourage the growth of a new industry.

Pastoral.

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—BEEF AND DAIRY CATTLE.

The Office of the Secretary of the undermentioned Herd Book Societies is 303 Queen street, Brisbane:—

The Australian Hereford Herd Book;
The Shorthorn Herd Book of Queensland;
The Jersey Herd Book of Queensland;
The Illawarra Herd Book of Queensland;
The Ayrshire Herd Book of Queensland;
The Milking Shorthorn Herd Book of Queensland;
The Holstein-Friesian Herd Book of Australia.

NOTE.—Animals registered in the Commonwealth Standard Herd Book are not necessarily eligible for entry in the Jersey Herd Book of Queensland.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
DAIRY BREEDS.				
AYRSHIRES.				
L. H. Paten	"Jeyendel," Calvert, S. & W. Line	8	21	Ayrshire Herd Book of Queensland
J. H. Paten	Gwandalan, Yandina	6	21	Do.
Queensland Agricultural College	Gatton	4	40	Do.
State Farm	Warren	3	83	Do.
J. W. Paten	Ayrshire Park, Wanora, Ipswich	10	42	Do.
J. H. Fairfax	Marinya, Cambooya	9	55	Do.
J. Holmes	"Longlands," Pittsworth	6	20	Do.
H. M. Hart	Glen Heath, Yalangur	7	21	Do.
F. A. Stimpson ..	Ayrshire Stud, Fairfield, South Brisbane	7	77	Do.
M. L. Cochrane ..	Paringa Farm, near Cairns	5	21	Do.
John Anderson ..	"Fairview," Southbrook	7	34	Do.
JERSEYS.				
T. Mullen	"Norwood," Chelmer	3	20	Jersey Herd Book of Queensland
Queensland Agricultural College	Gatton	2	31	Do.
M. W. Doyle	"Oaklands," Moggill	4	12	Do.
G. A. Buss	Bundaberg	1	15	Do.
R. Conochie	Brooklands, Tingoora	9	21	Do.
W. J. Barnes	Millstream Jersey Herd, Cedar Grove	10	37	Do.
W. J. Affleck	Grasmere, N. Pine ..	6	31	Do.
J. N. Waugh and Son	Prairie Lawn, Nobby	3	28	Do.
W. J. H. Austin ..	Hadleigh Jersey Herd, Boonah	2	11	Do.
State Farm, Kairi ..	Kairi, *viâ* Cairns ..	4	16	Do.
H. D. B. Cox	Sydney (entered in brother's name)	3	16	Commonwealth Standard Jersey Herd Book
GUERNSEYS.				
Queensland Agricultural College	Gatton	2	2	Eligible, but no Guernsey Herd Book of Australia

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—*continued.*

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
DAIRY BREEDS—*continued.*				
HOLSTEINS.				
Queensland Agricultural College	Gatton	2	9	Holstein-Friesian Herd Book of Australia
George Newman ..	"St. Athan," Wyreema	9	92	Do.
F. G. C. Gratton ..	"Fowlerton," Kingsthorpe	1	15	Do.
R. S. Alexander ..	Glenlomond Farm, Coolumboola	1	3	Do.
Ditto	Ditto	1	..	Holstein-Friesian Herd Book of New Zealand
S. H. Hoskings ..	St. Gwithian, Toogooloowah	..	..	Holstein-Friesian Herd Book of Australia
C. Behrendorff ..	Inavale Stud Farm, Bunjgurgen, Q.	3	9	Do.
E. Swayne	West Plane Creek, Mackay	1	2	Do.
ILLAWARRA.				
A. Pickels	Blacklands Stud, Wondai	4	62	Illawarra Herd Book of Queensland
J. T. Perrett and Son	Corndale, Coolabunia	3	43	Do.
W. T. Savage	Ramsay	2	22	Do.
Hunt Bros.	Springdale, Maleny ..	3	62	Do.
MILKING SHORTHORNS.				
P. Young	Talgai West, Ellinthorp	2	42	Milking Shorthorn Herd Book of Queensland
W. Rudd	Christmas Creek, Beaudesert	2	10	Do.
A. Rodgers	Torran's Vale, Lanefield	1	9	Do.
W. Middleton	Devon Court, Crow's Nest	3	27	Do.
A. K. Yorksten ..	"Dunure," Miles ..	2	8	Do.
BEEF BREEDS.				
SHORTHORNS.				
T. B. Murray-Prior ..	Maroon, Boonah ..	2	37	Queensland Shorthorn and Australian Herd Books
C. E. McDougall ..	Lyndhurst Stud, Warwick (2)	25	100	Queensland Shorthorn Herd Book
Godfrey Morgan ..	"Arubial," Condamine	3	6	Do.
W. B. Slade	E. Glengallan, Warwick	2	20	Do.
HEREFORD.				
A. J. McConnell ..	Dugandan, Boonah	19	36	Australian Hereford Herd Book
E. M. Lumley Hill ..	Bellevue House, Bellevue	45	127	Do.
Tindal and Son ..	Gunyan, Inglewood	50	400	Do.
SUSSEX.				
James T. Turner ..	The Holmwood, Neurum	2	4	Sussex Herd Book of England

RECORD PRICES FOR SHORTHORNS.

The English mail brings news of great trade in stud Shorthorn cattle at the February sales, at which Argentine and American buyers operated freely. At Penrith the British record price of 4,750 guineas was obtained for the champion bull, Gartley Lancer, bought by Mr. M. Marshall for the Argentine. This price compares with the previous record of 4,700 guineas, paid for a bull calf at the last sales at Collynie, in Scotland, and the previous English record for a bull of 4,500 guineas, which had stood since 1885. At the Penrith sale 228 bulls and 147 females sold for an aggregate sum of £46,705.

Windsor Knight, the King's champion bull of the Birmingham Show, early in February, realised 4,200 guineas, which was paid by an Argentine buyer. The reserve bull, exhibited by Earl Manners, was also sold for 4,200 guineas, but to an English breeder. Donnington's Court, a bull that was second to the King's champion in his class, was bought by Mr. Evan Jones for Australia, at 1,000 guineas.

Another notable sale, at the Perth Show sales, was of Lady Catheart's champion bull to Mr. W. Duthie, the noted Scottish breeder, for 4,000 guineas.

REPATRIATION CATTLE SALE.

Considerable interest was aroused in the "repatriation cattle sale" held at Marshlands, near Wondai. These cattle, comprising 1,400 head, were donated some three years ago by district graziers for the benefit of returned soldiers of the South Burnett district. The scheme originally was suggested by Mr. E. J. McConnell, of Marshlands, who not only contributed largely, but has grazed and superintended the cattle ever since. There was a good attendance of buyers, and the dispersal of the cattle was entrusted to John Bridge and Co., Ltd., who carried out the work free of any commission charges. Mr. D. M. Allen, of that firm, was in charge of the details, and Mr. J. Claude Henderson (Deputy Comptroller of Repatriation, Brisbane), represented the Federal Government. The total sum realised for the 1,400 head was £6,000 which is claimed to be very satisfactory, considering the limited demand for stock at the present time owing to the fear of a shortage of water in the district during the coming winter. A feature of the sale was that a number of lots were put up exclusively for returned soldiers, and good competition resulted. The cattle were presented in good condition and were arranged in lots. The chief buyers were Lord Brothers, of Eskdale, and G. D. Fox, of Wigton, as well as a number of small holders.

SHEEP ON COASTAL AREAS.

A very interesting report from Inspector of Stock J. H. Macarthy has been received relative to the keeping of sheep on coastal areas. Following is a resumé of the report:—"Mr. George Clark, farmer, of Tabragalba, informed the inspector that sheep combined with farming have given him very good results during the past twelve months.

Recently he sent a consignment of shorn fat lambs (six months' old) to Enoggera for sale and they netted him 23s. per head, while the fleece taken from them yielded 4s. 6d. per head; thus the lambs returned him net £1 7s. 9d. per head—an excellent return. Mr. Clark also sold some wethers bred on the farm (aged sixteen months) for £1 15s. 6d. per head, in addition to 12s. 6d. per head for the wool shorn off them.

In regard to the chief trouble of farmers who keep sheep on coastal areas—*i.e.*, stomach worms, Mr. Clark took no chances, but drenched his sheep with one of the drenches recommended by the Department of Agriculture and Stock.

This is only one of the many instances where sheep have been successfully bred and fed on coastal areas, to which the Departmental records can testify.

There have been some failures, it is true, but a proportion of failures is bound to be found in any business.

The world is more than ever hungry for meat and wool, and it is to be feared that the flocks of Australia have been sadly depleted during the past five or six years. In Queensland alone the numbers have receded from about 23,000,000 in 1915 to under 14,000,000 in 1919. New South Wales is suffering now from the worst drought ever experienced in the sheep districts. There is thus every likelihood of prices keeping at present levels for years. Therefore, all farmers should keep, at least, 100 sheep as a most profitable side line. There is always sheep feed on coastal areas, even in the driest times.

The Horse.

A NEW ZEALANDER'S VIEW OF PERCHERONS.

Born in Scotland, I have for many years been breeding Clydesdales in New Zealand. When the war broke out I returned to England, but was turned down by the fighting forces in both British and French armies, by reason of the fact that I had passed fifty. I was finally accepted as an ambulance driver in the French army, and served in the thick of it for two and one-half years. Disabled for further service, I was retired, and am on my way back to New Zealand to render there such aid as I can give. My experience in service in France has convinced me that the Percheron horse excels all other draft breeds. My observation on the battlefields has shown me that the Percheron can do all that any of the other draft breeds can, and a good deal more. Percherons excel in constitution. I have seen them exposed to the most inclement weather, without shelter, driven ofttimes to the limit, then swung to one side and left standing for hours in a bitter storm, and under these most adverse conditions they manifested a hardiness, a resistance to wind and wet and cold, and an ability to survive on limited rations of most indifferent character, that far excelled all other breeds subjected to the same conditions. This power to survive while others were going unserviceable or dying I term constitution, and in this the Percheron far excels all others. I have seen them as purebreds drawn from the Perche, and their grades drawn from America, and in this all-important essential they are unequalled.

Next to their constitution I rate their activity. Heavy gun horses of Percheron breeding proved far superior to all other breeds in their ability to go out and trot at a good fast clip for a long distance, and in activity and sure-footedness in putting guns into places over broken ground. Their speed, activity, and handiness I consider amazing, when the difficult character of the terrain is considered.

Their docility is equally important. Balking or jibbing is virtually unknown among them, and they can be hitched together in any desired combinations without trouble. This is of incalculable value on the battlefield, for in tight places cool, level-headed horses are as valuable as brave men. Time and again I have known horses to be killed by shell fire when going into action, but no trouble was encountered in cutting out the dead horses and in taking the guns through with what remained. Excitable, rattle-headed horses, or those inclined to fight each other, are an abomination under such desperate conditions, and in steadiness and coolness under fire, due to docility, the Percheron horses by far excel all other draft breeds, as thousands of artillerymen will testify from actual experience with them under fire.

I have already assisted one of my relatives, who owns 5,000 acres in Staffordshire, England, to select the foundation animals for a stud there. They are already in Britain and are doing splendidly. I am purposely returning through the United States to see the American-bred Percherons, and from what I have seen I am confident that as soon as ship transportation eases up, some Percherons will be taken from the United States to New Zealand and Australia.

It takes a good deal to convert a Scotchman to a breed not of his own country, but the stress of war has changed many ideas we have heretofore held. I am convinced that the Percheron is the most valuable draft breed in the world, and I intend to have some of them in the not far distant future.—"Farm Bulletin."

RECORD PRICE FOR MAIZE.

During the month of April this year the price of maize rose steadily until the high price of 8s. 10d. per bushel was reached for a prime consignment from Beenleigh, and another lot from Caboolture realised 8s. 9d. per bushel, or about 1s. per bushel over the highest price obtained for this cereal towards the end of March. In May, maize was sold for 10s. per bushel. In December last prices ranged from 5s. 6d. to 6s. per bushel. Lucerne chaff also, owing to the commencement of the cold weather in April, took a considerable leap upwards at the Roma Street Markets, from £8 and £9 to £13 and over per ton. Sweet potatoes, which usually bring from 4s. to 5s. 6d. per cwt., were sold at 13s. In May the price of maize touched 9s. 7d. per bushel.

Dairying.

CIRCUMSTANCES INFLUENCING MILK SECRETIONS.

Age.—A cow in good health continues to improve in milk-yielding capacity up to her seventh or eighth year. The milk of a young cow is richer in fat, while that of an aged cow is reduced in total solids.

Period of Lactation.—A cow attains her highest yield, as regards quantity, about six to eight weeks after calving; thence she declines till she grows dry about the 300th day in average cases. The total solids in the milk increase as the quantity decreases, the increase being in the fat and casein, while the albumen and milk sugar may become reduced.

Period of Year.—A flush of young grass in early summer stimulates the milk yield of cows in whatever period of lactation they may be, while the dry, brown pastures and hot weather in autumn cause a shrinkage of the same. In the hot weather of summer there is an increase of olein in the butter fat, while in the cold weather of winter there is more stearin developed. Thus butter is softer in summer and harder in winter, irrespective of temperature.

Food.—The food largely influences the quantity of the milk and the proportion of cream and butter obtained therefrom. The result of investigations tends to show that while the composition of the milk is little, if any, altered by a change in the nature of the food (or only temporarily altered), the "churnability"—*i.e.*, the proportion of butter which can be obtained from the milk produced by different foods—varies according to the nature of the food, as hereafter shown.

Water Supply.—A plentiful supply of good water is necessary both in summer and winter, but more especially in hot summer weather, to enable cows to milk well. According to experiments made at Geneva (New York) with seven different breeds, they require about 5 lb. of water to every 1 lb. of milk yielded; every 1 lb. of dry food requiring 3 to 4 lb. of water.

Temperature.—Cows give their largest yield when kept at a temperature of 63 degrees F. This is often exceeded in summer in European and American countries where cows are housed, while in winter it is found impossible to keep the air of the cowhouses up to this from the natural heat of the animals alone, and at the same time have proper ventilation, while if they are turned out for exercise they are more likely to take chills in coming from a high temperature. All things considered, 55 degrees F. is the most suitable temperature.

Temperament.—An animal with a healthy, well-developed nervous organisation will milk better than one with a sluggish, phlegmatic temperament—*i.e.*, the most intelligent cow is the best milker. Such an animal requires very careful treatment, however, otherwise she will degenerate into a nervous, fidgetty, restless animal, easily frightened, with a correspondingly adverse effect on the milk yield.

Œstrum.—The service heat affects some cows very little, but in most cases the quantity of the milk is reduced, the specific gravity is decreased, the percentage of fat reduced (to 1 per cent. sometimes), and the butter made from the same is white (or nearly so) in colour. These changes disappear quickly—lasting from two to three days—immediately the œstrum is over.

Treatment.—Gentle treatment is of the utmost importance, as anything that ruffles the animal makes her unwittingly "hold up" her milk, and eventually largely decreases the daily yield; and it is thus of importance that she should never be hunted with dogs, struck, or harshly spoken to, but be petted as much as possible.

Milking.—Quick milking and clean milking largely increase the quantity of milk and the percentage of butter fat therein, while slow and slovenly work reduces the yield in every way and permanently "dries up" the cow. Good milking will do more to increase the yield than any other circumstances, while an inferior milker will injure the animals more than all other good treatment will counteract. Babcock found, as the average of several experiments, that quick milking produced from 2 to 13 per

cent. more milk, which was 10 per cent. richer in fat, than that produced by slow milking; and this superiority continued for several months until the cows naturally began to decline.

CHURNABILITY OF BUTTER FAT.

Proportion of Total Butter Fat in Milk obtained by Churning, according to the Food used.

	Per cent.
Pasture and bran	91.16
Pasture alone	86.64
Hay, maizemeal, and bran	84.18
Hay and bran	81.37
Ensilage (mixed)	81.25
Hay and maizemeal	74.63
Ensilage and maizemeal	65.69
Hay and starch refuse (gluten meal)	63.89

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, 1919, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1919 AND 1918, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1919.	April, 1918.		April.	No. of Years' Records.	April, 1919.	April, 1918.
North Coast.					*South Coast*—continued:				
	In.		In.	In.		In.		In.	In.
Atherton	4·25	18	5·91	4·33	Nambour	4·64	23	7·46	7·16
Cairns	11·65	37	17·76	8·23	Nanango	1·87	37	1·38	1·33
Cardwell	9·81	47	13·09	7·70	Rockhampton	2·27	32	4·93	3·38
Cooktown	9·33	43	3·63	6·32	Woodford	4·14	32	3·27	2·53
Herberton	4·31	32	2·61	3·29					
Ingham	8·63	27	13·77	8·19					
Innisfail	21·74	38	20·52	17·56					
Mossman	11·33	11	17·28	6·81					
Townsville	3·70	48	2·79	2·62	*Darling Downs.*				
					Dalby	1·31	49	0·84	1·13
Central Coast.					Emu Vale	1·25	23	0·53	2·77
					Jimbour	1·39	31	0·59	1·27
Ayr	2·73	32	3·85	1·84	Miles	1·49	34	1·59	2·16
Bowen	3·03	48	2·77	2·27	Stanthorpe	1·76	46	*nil*	1·31
Charters Towers	1·71	37	3·81	1·02	Toowoomba	2·53	47	1·64	1·58
Mackay	6·85	48	9·13	9·25	Warwick	1·42	32	0·29	3·41
Proserpine	6·70	16	11·14	8·35					
St. Lawrence	2·92	48	3·43	7·82	*Maranoa.*				
South Coast.					Roma	1·34	45	0·51	3·17
Biggenden	1·69	20	2·26	3·06					
Bundaberg	2·85	36	1·53	4·81	*State Farms, &c.*				
Brisbane	3·60	68	1·99	1·70					
Childers	2·42	24	0·92	4·04	Bungeworgorai	1·22	5	0·25	2·92
Crohamhurst	5·42	25	7·13	5·64	Gatton College	1·82	20	0·26	1·63
Esk	2·67	32	1·66	1·38	Gindie	1·19	19	2·20	2·70
Gayndah	1·33	48	2·10	2·07	Hermitage	1·49	13	0·47	3·61
Gympie	3·09	49	3·57	3·17	Kairi	3·59	5	5·75	4·08
Glasshouse M'tains	4·68	11	4·88	4·48	Sugar Experiment Station, Mackay	5·28	22	9·52	8·42
Kilkivan	2·10	40	1·35	1·99	Warren	1·38	5	2·31	2·95
Maryborough	3·27	48	2·49	3·35					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year, and for the same period of 1918, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1919.

The total number of eggs laid for the month was 4,187. The birds are now settling down nicely, and very few indeed show signs of moulting. There were two deaths during the month, but these birds have been replaced. Nine cases of sickness required attention. There was one case of broodiness in the heavy section. The heavy breeds have settled down somewhat better than the light breeds, a number of the latter being very undecided to get into regular work. Some good scores in the heavy section may be looked forward to, provided the weather still holds good during next month. The feeding in this section is all that can be desired. The following are the individual scores:—

Competitors.	Breed.	April.
LIGHT BREEDS.		
*Dixie Egg Plant	White Leghorns	116
*W. Hindes	Do.	106
J. H. Jones	Do.	99
*J. M. Manson	Do.	96
*Range Poultry Farm	Do.	94
*G. W. Hindes	Do.	90
*Quinn's Post Poultry Farm	Do.	90
*Thos. Taylor	Do.	90
*Dr. E. C. Jennings	Do.	89
*W. Lyell	Do.	89
*Haden Poultry Farm	Do.	87
S. McPherson	Do.	84
Geo. Williams	Do.	83
S. W. Rooney	Do.	82
*H. Fraser	Do.	80
*E. A. Smith	Do.	80
Geo. Trapp	Do.	80
*C. P. Buchanan	Do.	75
Mrs. N. Charteris	Do.	72
*B. Caswell	Do.	67
*W. Becker	Do.	67
G. J. Byrnes	Do.	66
B. Chester	Do.	66
Oakleigh Poultry Farm	Do.	63
*T. Fanning	Do.	62
H. A. Jones	Do.	61
*L. G. Innes	Do.	58
C. A. Goos	Do.	57
*O. W. J. Whitman	Do.	54
N. A. Singer	Do.	53
*Mrs. R. Hunter	Do.	53
H. O. Jones	Do.	51
W. A. Wilson	Do.	47
R. C. J. Turner	Do.	40
W. Morrissey	Do.	29
*Mrs. L. Anderson	Do.	27
*Mrs. A. G. Kurth	Do.	27
J. H. Dunbar	Anconas	22
G. H. Kettle	White Leghorns	10
*J. J. Davies	Do.	7
J. W. Newton	Do.	0

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	April.
HEAVY BREEDS.		
*E. M. Larsen	Black Orpingtons	122
Geo. Nutt	Do.	113
*R. Burns	Do.	100
*Nobby Poultry Farm	Do.	95
*R. Holmes	Do.	94
*A. E. Walters	Do.	88
*W. Smith	Do.	88
*D. Fulton	Do.	82
*E. F. Dennis	Do.	80
*A. Shanks	Do.	78
Mrs. M. E. Smith	Do.	71
*Kelvin Poultry Farm	Plymouth Rocks	67
*Jas. Ferguson	Chinese Langshans	57
*E. Morris	Black Orpingtons	56
A. Homan	Do.	55
R. B. Sparrow	Do.	50
C. H. Singer	Do.	43
*T. Hindley	Do.	42
*H. Puff	Rhode Island Reds	36
*Mars Poultry Farm	Black Orpingtons	34
*W. H. Reilly	Chinese Langshans	21
H. Ashworth	Black Orpingtons	13
J. A. Cornwell	Do.	13
*T. B. Barber	Do.	12
*F. W. Leney	Do.	8
A. Gaydon	Do.	0
Total		4,187

* Indicates that the pen is engaged in single test competition.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
Dixie Egg Plant	18	18	21	21	19	19	116
W. Hindes	23	22	11	7	18	18	99
J. M. Manson	14	13	18	17	17	17	96
Range Poultry Farm	15	18	13	22	11	15	94
G. W. Hindes	17	17	18	15	9	14	90
Quinn's Post Poultry Farm	10	16	18	15	19	12	90
Thos. Taylor	19	10	12	15	19	15	90
Dr. Jennings	15	16	16	10	13	19	89
W. Lyell	9	16	19	15	15	15	89
Haden Poultry Farm	18	18	17	15	17	2	87
H. Fraser	7	18	17	15	5	18	80
E. A. Smith	8	17	19	18	0	18	80
C. P. Buchanan	0	18	13	9	17	18	75
B. Caswell	2	3	15	18	15	14	67
W. Becker	21	9	18	16	0	3	67
T. Fanning	19	1	14	9	7	12	62
L. G. Innes	13	7	8	7	13	10	58
O. Whitman	16	18	0	0	10	10	54
Mrs. R. Hunter	8	17	10	12	4	2	53
Mrs. A. G. Kurth	10	5	9	3	0	0	27
J. J. Davies	0	0	1	0	6	0	7
Mrs. L. Anderson	1	15	0	0	10	1	27

DETAILS OF SINGLE HEN PENS—*continued.*

Competitor.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
E. M. Larsen	20	23	15	18	23	23	122
R. Burns	18	18	12	25	10	17	100
Nobby Poultry Farm	16	17	3	23	15	21	95
R. Holmes	24	22	15	10	22	1	94
A. E. Walters	7	18	19	16	11	17	88
W. Smith	19	21	4	3	19	22	88
D. Fulton	12	20	18	17	17	1	82
E. F. Dennis	20	2	20	20	0	18	80
A. Shanks	12	12	19	24	0	11	78
Kelvin Poultry Farm	23	8	12	1	10	13	67
Jas. Ferguson	12	15	8	0	11	11	57
E. Morris	16	21	0	8	11	0	56
T. Hindley	24	11	0	6	0	1	42
H. Puff	13	0	7	16	0	0	36
Mars Poultry Farm	0	16	3	3	0	12	34
W. H. Reilly	6	1	6	8	0	0	21
T. B. Barber	3	6	0	0	0	3	12
F. W. Leney	2	0	0	6	0	0	8

POULTRY FOODS.

By J. C. BRÜNNICH, F.I.C., Agricultural Chemist.

The results of the analyses of the various poultry foods on the market clearly indicate that some manufacturers of such foods charge far too high a price for their mixtures. Again, nothing appears to be gained by making and selling a large number of different mixtures, under various names, as in most cases the foods are practically the same, and could be easily replaced by mixtures made by the poultry farmer himself, by adding a little bonemeal, or bone and meat meal, to his pollard and bran mashes.

The calculation of a comparative food value is not easy, but some close and fair approximation is obtained by taking the analyses and putting a monetary value on to the different valuable food constituents. For our purposes proteins and phosphoric acid, the most valuable constituents, are taken as 3d. per unit, carbohydrates and fibre at 1d. a unit, crude fat or oil at 2d. a unit, and lime at ½d. a unit; understanding as unit value the cost of 1 per cent. per cwt. of food.

Some foods contain small amounts of spices and iron, for which no value has been calculated and added, because the quantities of such stimulants required are exceedingly small.

The units chosen are very liberal because we find that in all the common by-products used as food, like bran, pollard, key meal, and Meggitt's meal, the value calculated from the analyses is found to be slightly higher than the actual market value of such foods, but in all the manufactured mixtures the market price is very much higher, and in a few cases quite exorbitant.

The ratio of proteins and carbohydrates is of importance in poultry foods, and as a rule a ratio of about 4—between 3½ and 5 is desired—which means that about four times the amount of carbohydrates, fibre, and fat are present, as compared with the amount of true protein. Foods like maize, at present quite out of question as a poultry food on account of its high price, contains too much carbohydrates, having a ratio of 8.4. Of course, analysis alone is not always sufficient to decide a value of a food, and microscopical examination is often necessary to prove the absence of injurious substances. Crushed wheatmeals have been put on the market containing too much refuse, and particularly bunt spores, which would make their use dangerous for poultry food.

ANALYSES OF POULTRY FOODS.

—	Moisture.	PROTEIN.		Carbohydrates, &c.	Fibre.	Oil and Fat.	ASH.				Protein Ratio.	Market Price, per cent.	Actual Value, per cent.
		Crude.	True.				Crude.	Insoluble.	Lime.	Phosphoric Acid.			
	%	%	%	%	%	%	%	%	%	%		*s.* *d.*	*s.* *d.*
Bone and meat meal ..	4·34	36·51	35·74	[1·84]	[3·88]	1·68	51·75	·22	26·75	19·10	·2	16 0	14 7
Pea meal	10·05	21·44	18·02	61·39	2·35	2·05	2·72	·04	·34	·59	3·8	18 0	11 1
Megitt's meal	9·50	26·63	23·06	35·86	9·70	11·85	6·46	1·24	·67	1·72	3·2	10 0	12 0
Maize meal	10·65	10·50	9·89	67·57	5·21	4·55	1·52	·06	·13	·40	8·4	20 0	9 4
Key meal	8·75	18·37	17·00	43·45	13·35	9·80	6·18	·14	·50	·88	4·0	8 0	10 10
Polly meal	8·05	19·81	19·68	61·31	5·50	3·65	1·68	·26	·16	·54	3·8	11 0	11 4
Bran	11·00	15·90	15·00	55·40	8·20	4·90	4·60	·18	·36	2·00	5·0	8 0	10 2
Pollard	10·50	17·40	15·50	56·80	6·00	4·90	4·60	·17	·35	1·88	4·8	8 0	10 4
Commercial Mixed Poultry and Chick Foods—													
1	·90	18·88	13·62	39·90	4·85	3·25	32·22	2·76	16·16	6·77	3·9	60 9	9 8
2	7·15	19·25	17·50	53·26	4·15	3·55	11·64	1·88	·83	·72	3·7	67 0	9 11
3	7·80	32·75	30·81	21·71	4·80	7·20	25·74	·62	12·70	9·65	1·4	18 0	13 6
4	9·50	11·07	8·71	71·23	3·28	3·00	1·92	·30	·25	·57	9·3	17 0	9 0
5	9·64	13·87	10·94	67·53	3·32	3·34	2·30	·24	·34	·78	7·2	19 6	9 5
6	10·55	14·09	10·34	66·18	2·76	4·04	2·38	·29	·34	·76	7·6	17 6	9 3
7	8·50	32·02	28·25	18·13	4·55	5·80	31·00	·24	14·86	11·53	1·3	18 0	13 7
8	13·10	17·69	15·75	52·29	7·50	1·90	7·52	1·04	2·01	2·46	4·1	14 7	9 10
9	12·50	15·63	13·65	57·12	4·85	2·40	7·50	·28	3·02	3·03	4·9	13 2	9 8

The Orchard.

FRUITGROWERS' CONFERENCE.

NOTES IN CONNECTION WITH A CONFERENCE OF FRUITGROWERS, HELD IN THE LAND COURT ROOM, EXECUTIVE BUILDINGS, BRISBANE, ON THURSDAY AND FRIDAY, 3RD AND 4TH APRIL, 1919.

A conference of fruitgrowers was held in the Land Court Room, Executive Buildings, Brisbane, on the 3rd and 4th April, 1919, commencing at 10 a.m. on the former date.

Owing to indisposition, the Honourable the Minister for Agriculture was unfortunately unable to be present to open the conference, but his place was taken by the Under Secretary, who, on his behalf, welcomed the delegates and expressed the hope that the industry would be materially benefited as a result of their deliberations.

Mr. Brown, Montville, apologised for the absence of Mr. R. J. Warren, M.L.A., owing to an important business engagement, and later, Mr. Warren attended to express his regret that he was unable to stop right through the deliberations, and he also expressed the hope that the industry would be benefited as a result of the conference.

The following is a list of the delegates present:—

D. Pfrunder—Applethorpe Fruitgrowers' Association;

J. McLean—Beerwah and Coochin Creek District Farmers and Fruitgrowers' Progress Association;

J. Macdonald—National Agricultural and Industrial Association;

S. Lamont—Horticultural Society of Queensland;

W. E. Dean—Buderim Mountain Fruitgrowers' and Progress Association;

C. R. Warrick—Caboolture P.A. and I. Society;

W. A. Gibson—Cleveland A.H. and I. Society;

H. Mungill—Fletcher Fruitgrowers' Association;

A. Butchart—Ipswich Horticultural Society;

McKeon—Kilkivan P.A. and I. Association;

J. R. Morris—Mapleton Fruitgrowers and Farmers' Progress Association;

F. Copley—Wide Bay and Burnett P. and A. Society, Maryborough;

T. H. Brown—Montville Fruitgrowers, Farmers' and Progress Association;

W. W. Mallet—Maroochy P.A.H. and I. Society, Nambour;

H. Harding—Rosewood A. and H. Association;

A. J. Buchanan—Brighton Farmers and Fruitgrowers' Progress Association, Sandgate;

A. H. Paget—The Summit Fruitgrowers' and Progress Association;

H. C. Cowie—Woodford District Fruitgrowers' Association;

S. J. McBaron—Cooloolabin Farmers and Fruitgrowers' Association, Yandina;

F. M. Ruskin—Zillmere A.H. and I. Society;

C. Johansen—Fruitgrowers' Association, Ballandean;

J. Aird—Fruitgrowers' Association, Bli Bli;

C. R. Wilson—Fruitgrowers' Association, Glasshouse Mountains;

T. R. Miller—Fruitgrowers' Association, Perwillowen, Nambour;

W. H. Parker—Queensland Fruitgrowers' Industrial Trading Society, Brisbane;

Jas. Collins—Fruitgrowers' Association, Redland Bay;

A. C. Woods—Fruitgrowers' Association, Rochedale;

E. Smallman—Fruitgrowers' Association, Wellington Point;

H. Randall—Fruitgrowers' Association, Wynnum West;

A. Keers—Fruitgrowers' Association, Beerburrum;

Jas. Wayman—Fruitgrowers' Association, Broadwater, Stanthorpe;

D. McLaurin and H. Freeman—Fruitgrowers' Association, Currumbin;

C. R. Warrick—Fruitgrowers' Association, Elimbah;

W. Kuhn—Fruitgrowers' Association, Palmwoods;

I. A. Dakin—Fruitgrowers' Association, Thulimbah;

R. E. Whiting—Fruitgrowers' Association, Wamuran, Kilcoy Line;
W. W. Mallet—Maroochy P.A.H. and I. Society, Nambour;
W. Ellison—Fruitgrowers' Association, Landsborough;
J. A. Loggie—Manly Road Fruitgrowers' Mutual Benefit Association;
R. J. Warren, M.L.A.—North Coast Fruitgrowers' Association.

After the roll had been called the Director of Fruit Culture was voted to the chair, and after thanking the delegates for the honour they had conferred upon him, he called upon Mr. T. H. Brown (Montville) to open the discussion upon the first item on the agenda paper, viz.:—The necessity for combined action by fruitgrowers in the formation of a non-political and non-trading association to deal with and watch the interests of the fruitgrowing industry throughout the State.

Mr. Brown gave an outline of the events which led up to the calling of the conference, referring to a communication from his association to the Department of Agriculture and Stock, asking that such a conference be called, and following this with the action that was taken at a conference of fruitgrowers held at Palmwoods during this spring, when it was decided to form a North Coast fruitgrowers' association.

He stated that when the growers of the North Coast had realised that, through their want of organisation, they were not reaping the full benefits of their industry, they had taken steps which resulted in the formation of the present North Coast Fruitgrowers' Association.

He then dealt with the success that had been attained by this organisation in the transport by train of bananas and pineapples to the Southern markets, thereby enabling the growers to dispose of these fruits at a time when the coastal shipping trade was practically at a standstill, and without which the greater portion of the fruit would, in all probability, have been lost or realised such a low price on the local market as to be unremunerative.

Mr. Brown strongly urged the importance of organised effort, and pointed out the benefits to be derived therefrom. He was in favour of the growers in all fruit districts being organised for mutual protection, and trusted that, once such local organisation was effected, an association as outlined in the agenda paper, would be an established fact.

The Chairman then called upon Mr. W. H. Parker, the chairman of the Queensland Fruitgrowers' Industrial Trading Society, and President-elect of the forthcoming Interstate Fruitgrowers' Conference, to be held in Brisbane at the end of May.

Mr. Parker endorsed the remarks made by Mr. Brown, and emphasised the extreme importance of organised effort. He gave a brief outline of the working of the Queensland Fruitgrowers' Industrial Trading Society, and showed the good results that had accrued from the formation of that society. He also referred to the recent Interstate Conference of Fruitgrowers, held in Launceston, Tasmania, and showed that organisation had already received great attention in New Zealand, Victoria, and Tasmania.

With respect to New Zealand, he informed the conference of the splendid work that had been done, and pointed out the advantages to be derived from the formation of a strong Queensland Association which would, he hoped, eventually work in conjunction with similar associations in the different States of the Commonwealth and the Dominion of New Zealand.

He gave the conference much valuable information, and his remarks were listened to with much appreciation.

The discussion was continued by Mr. Dakin, the chairman of the combined associations of the granite belt, who also supported the idea of a Queensland association, and agreed with the principles expressed, but pointed out that he and his co-delegates from Stanthorpe and district were not empowered to bind their associations in any way, though they were prepared, on their return to their individual associations, to strongly recommend their joining in the formation of a combined association such as that outlined, and they would point out the benefits to be derived from the existence of a Central Executive.

Mr. W. E. Dean (Buderim) stated that his association strongly supported the formation of a Central Executive, with the ultimate idea of combining with the other States, and he endorsed the remarks of the previous speakers.

Mr. Paget (The Summit) supported the remarks of Mr. Dakin, and pointed out the advantages that had been derived by the Stanthorpe growers from their local conferences of fruitgrowers, to which each fruitgrowing centre in the granite belt sends two delegates from its association, the meetings taking place in Stanthorpe.

As an instance of the value of organised effort, Mr. Paget pointed out the success that had been attained by their association with respect to the limiting of the importation of American apples, and expressed the opinion that there was no necessity for such importation, as the different fruitgrowing districts of the Commonwealth were quite capable of producing all the apples required for consumption within the Commonwealth, as the late keeping varieties grown in the Southern States could be held over till the early ripening varieties of the Stanthorpe district were ready. He considered there should be no break in the supply of this essential fruit, provided its distribution was properly regulated.

Mr. C. R. Wilson endorsed the need for organisation, and pointed out that in New Zealand, such bodies were of a co-operative nature, being trading societies.

After further discussion the question as to whether an association such as that outlined in the agenda paper was needed was submitted by the Chairman, and a resolution to that effect was moved by Mr. J. R. Morris, seconded by Mr. C. R. Wilson, and carried unanimously.

Mr. Wilson then moved, as it had been considered advisable to form such an association, the name should be "The Queensland Federated Fruitgrowers' Association." This was seconded by Mr. Parker, and after discussion was carried, the Stanthorpe delegates refraining from voting.

The question of determining the best means to be adopted to bring such association into effect was next considered. Mr. Dakin (Thulimbah) recommended that the matter be placed before the whole of the fruitgrowers' associations of Queensland, and that they be asked to organise on lines similar to those already in operation in the North Coast and Stanthorpe districts. He pointed out the necessity of having the assistance of every association of fruitgrowers, and suggested that each delegate present should, on his return, bring this matter before his association.

The question having been raised as to the Stanthorpe delegates not having power to commit their associations to any definite action, Mr. Dakin pointed out that he had no doubt they were really at one with the other delegates in their desire to take such measures as would tend to the general advancement of the fruitgrowing industry, and with regard to the formation of a central body he had no doubt but that they would fall into line.

In order that associations, similar to those in existence in the North Coast and Stanthorpe districts, be formed, Mr. Brown suggested that the State of Queensland should be divided into six fruitgrowing districts as follows:—

(1) Stanthorpe;
(2) South Coast;
(3) Metropolitan (as far as Caboolture);
(4) North Coast (Caboolture to Gympie);
(5) Wide Bay and Burnett district (Gympie to Rockhampton);
(6) Bowen and the North;

with power to add. He submitted this as a motion, which was seconded by Mr. McBaron (Cooloolabin). Mr. Morris supported the motion, which, after discussion, was carried.

In order to give effect to this, a resolution proposed by Mr. A. C. Woods (Rochedale), and seconded by Mr. W. H. Parker, to the effect "That it be a recommendation from this conference to the fruitgrowers of Queensland to form fruitgrowing associations in each fruitgrowing district," was carried.

After the adjournment for lunch, the question of the formation of district councils was considered, and it was pointed out by Messrs. Dakin, Brown, and McBaron that as only the North Coast and Stanthorpe districts had such councils, the other districts, as outlined, should at once get to work and form their associations (if necessary) and district councils. Mr. Brown was of opinion that the districts not already organised should be prepared to send delegates to another meeting in a few months' time to form the central executive.

The Chairman strongly endorsed the necessity for the different districts which did not already possess fruitgrowing associations to organise and form such associations for the purpose of delegates from these associations meeting and forming a district council on the same lines as those now in existence in the Stanthorpe and North Coast districts.

Mr. Ellison (Landsborough) and Mr. Brown supported this opinion.

After further discussion the following motion was moved by Mr. J. McLean (Beerwah), and seconded by Mr. H. Randall (Wynnum West):—"That, in the opinion of this conference, the delegates representing those districts who do not

possess an executive body in their midst, urge upon the growers of their districts the necessity of organising into fruitgrowers' associations, and that these associations form a district executive.'' This motion, on being put to the meeting, was carried by 23 votes to 9.

In order to give effect to this resolution, Mr. Ellison suggested that interested persons in each of the districts should take upon themselves the calling together of the fruitgrowers of their respective districts. Mr. Brown strongly supported the suggestion, and Messrs. Gibson, Smallman, Whiting, Woods, Ruskin, McBain, and Copley promised to do their best to bring the matter before the growers of their districts.

At this stage, Mr. Mallet, as Vice-President of the North Coast Fruitgrowers' Association, promised that members of their executive would be only too glad to give any assistance they could to bodies in other districts, in the way of addressing meetings and pointing out the advantages already derived by the North Coast association, provided their out-of-pocket expenses were paid. The Chairman also promised to give similar assistance where any bodies of growers required same.

Mr. Paget suggested that three months be given to the unorganised districts to organise and form their district councils, and then proposed, ''That, in the opinion of this conference, three delegates from each district council should meet in Brisbane within three months from the date of the conference to further the formation of the Queensland Federated Fruitgrowers' Association.'' This motion was seconded by Mr. Brown, and carried.

The Chairman, in order to place the fullest information in the hands of the growers, promised to communicate with the States of Victoria and Tasmania and the Dominion of New Zealand, and ask that a number of copies of the rules and constitution of their central fruitgrowers' associations be supplied.

It was decided to leave the question of the scope of the work to be undertaken by the proposed central association to the meeting of delegates to be held within the next three months, Mr. Wilson pointing out that special attention should be given to the question of providing better marketing facilities in order to prevent gluts.

This concluded the discussion, and as time permitted the Chairman asked if there were any matters of interest to growers that any delegate wished to bring forward.

Mr. McBain (Aspley) brought up the question of second-hand cases, and pointed out the disability that growers were under by having to pay excessive prices for such cases. The matter was fully discussed by many of the delegates, and it was suggested that the case, instead of being sold with the fruit, should remain the property of the seller.

Mr. Dakin and the Chairman pointed out that the ownership of the cases is purely a matter of trade usage, as there is no reason why, if the growers throughout the State are unanimous on the matter, the case should not remain the property of the seller of the fruit or vegetables exactly the same as occurs in the biscuit trade where the tin is charged for and the charge refunded when the tin is returned. The matter was therefore deferred to the consideration of the central executive when that body is formed.

Several growers pointed out that they had already been able to make arrangements for the return of their cases, so that the conference considered there should be no difficulty in making this condition general where the fruit is sold within the State of Queensland.

Mr. Morris then brought up the question of the potash supply for orchardists, and pointed out the disability that fruit and vegetable growers were under through their inability to obtain a supply of this essential plant food. He pointed out how necessary this material was for the grower of pineapples, bananas, and citrus fruits.

The Chairman endorsed the remarks of Mr. Morris as to the value of potash, and stated that he had received information that a potash nitrate salt was likely to be placed on the Australian market before the end of the year, and he further expressed the opinion that, as soon as the restrictions governing the export of potash from Germany were withdrawn, supplies would accordingly become available in Australia, and prices eventually return to something approaching their pre-war value.

Mr. Brown pointed out that the Federal Government had already been approached on the question of their obtaining a supply of potash for fruitgrowers and controlling its distribution. Mr. Mallet mentioned that the Queensland Farmers' Union had also moved in this matter, and he further submitted the following resolution:— ''That a letter be sent through the Minister for Agriculture to the Minister for Trade and Customs, drawing his attention to the absolute necessity for an immediate

supply of potash for the fruitgrowers of Queensland, especially considering the fact that a large number of returned soldiers are being settled on the land for fruitgrowing purposes, and further recommending that the Commonwealth authorities should control the supply.'' This motion was seconded by Mr. Brown, and on being put to the meeting was carried unanimously.

Prior to the adjournment, a further discussion took place on the running of the fruit trains, and several matters of interest were dealt with, particularly the difficulty of filling a truck at the smaller stations. The advantage of the trains for the carriage of vegetables, such as tomatoes and cucumbers, was also pointed out, and the Stanthorpe delegates expressed the hope that next season they would be in a position to co-operate and forward a quantity of early fruits for the Southern markets.

On the motion of Mr. Ruskin, seconded by Mr. Dakin, a hearty vote of thanks was accorded to the North Coast Fruitgrowers' Association for bringing about the present conference.

The conference then adjourned till the following day.

FRIDAY, 4TH APRIL, 1919.

On resuming business, the Chairman stated that at the special request of the Stanthorpe delegates, who were attending a deputation to the Railway authorities, the first item on the agenda paper for that day, viz., the discussion on the advisability of amending the Diseases in Plants Act, &c., would be deferred until their return to the conference. In the meantime, the question of deciding what matters it was desirable to submit to the Interstate Fruitgrowers' Conference was proceeded with, Mr. Parker (as President-elect of the Interstate Conference) being called upon for a few remarks.

Mr. Parker pointed out that it was at present proposed to hold the conference at the end of May, and the last information he had received from the secretary, in Melbourne, was to the effect that the conference should be held. The speaker, however, pointed out that on account of the quarantine regulations, in his opinion, it was doubtful whether the conference would be held at the time proposed. At the same time it was essential for them to make all the necessary arrangements for the holding of the conference.

He pointed out the good work that had been done by similar conferences in the past, and asked for the support of the various fruitgrowing associations in the State in making the forthcoming conference a success. With regard to the agenda paper, he mentioned that the subject of ''Bitter Pit'' would be brought forward by Mr. H. Tryon, the Government Entomologist and Vegetable Pathologist, as it was a subject he considered of the greatest possible interest to the apple-growers of the Stanthorpe district.

He stated that other matters resulting out of the recent conference, held at Launceston, would also be discussed.

The Chairman asked if there were any matters the delegates wished to be submitted to the Interstate Conference, and a motion was proposed by Mr. J. McLean, and seconded by Mr. C. R. Warrick: ''That it be a recommendation from this conference that the matter of uniform grade marking be submitted to the forthcoming Interstate Fruitgrowers' Conference, and that the question of fixing a grade standard for citrus and tropical fruits be considered.'' This was carried unanimously.

In reply to a request from a delegate the Chairman called upon Mr. Freeman, of Currumbin, for information respecting the methods employed by him in the grading and packing of bananas for the Southern markets.

Mr. Freeman stated that he invariably graded his fruit for size and quality, only packing large fruit, of equal quality in the same case for his first grade, and similar fruit of even quality in the second grade, the third grade consisting of smaller and more uneven quality fruit.

In packing, after lining the case with either paper or dried banana leaves, in the case of the first grade he always placed the cut end of the hands downward on the bottom of the case, taking care that the fruit was packed as firmly as possible till the bottom layer was completed. The top layer was then placed point to point with the bottom layer, and the top of the case, when the packing was completed, was treated in the same manner as the bottom and sides.

In the case of the second grade fruit the hands were packed with the cut surface at the sides and the points of the hands meeting in the centre, and if there were

any spaces left, then fruit of equal size to that contained in the hand was used to fill in such spaces. This method of packing was continued until the case was full. The same course was carried out in the case of the third grade.

His experience was that the systematic grading of the fruit, both for size and quality, was a material benefit to him financially. A vote of thanks was accorded Mr. Freeman for his valuable information.

Considerable discussion then took place on the question of the importation of fresh fruit from America, and eventually, on the motion of Mr. Dakin, seconded by Mr. Pfrunder, the following resolution was carried:—"That it be a recommendation from this conference that the Interstate Conference take into consideration the Federal control of the importation of American fresh fruit when the present embargo is raised."

The question of having a citrus case of uniform shape and capacity was submitted by Mr. Brown, who was in favour of making the use of a case similar to that used for the packing of imported American citrus fruits the standard.

Considerable discussion took place on this subject, some of the delegates being of the opinion that owing to the width of the ends of the case there would be considerable difficulty in the matter of shrinkage as the timber dried. Others again strongly favoured the flat packer, both Messrs. Dean, of Buderim Mountain, and James Collins, of Redland Bay, being strongly in favour of this particular sized case.

The Chairman pointed out that a large amount of latitude respecting the shape of the cases in which to pack citrus fruits was allowed under the Fruit Cases Act, and that already a case identical in shape and capacity to that used by the Californian growers for shipment to Australia was legalised.

It was therefore decided to leave the matter in abeyance and to allow growers to use such cases as they deemed most suitable, provided they were of the standard capacity.

The question of altering the dimensions of the tropical fruit case, which is used for packing pineapples and bananas, was submitted by Mr. Smallman, who pointed out the anomaly that at present existed in that, in the case of the flat packer, the tops, bottom, and sides required timber 28 inches long, whereas the tropical fruit case only required tops, bottoms, and sides of 26¾ inches. He therefore suggested that, if possible, the tropical fruit case should have its tops, bottoms, and sides of the same length as that required in the flat packer, but in order to do this it would be necessary to reduce either the width or depth of the case. After discussion, in which many delegates took part, it was decided, on the motion of Mr. Brown, seconded by Mr. Smallman: "That it be a recommendation from this conference to the growers of the North Coast and South Coast districts, that tests be made with a pineapple case having 28-inch tops, bottoms, and sides, and of the same cubic capacity as the present tropical fruit case, viz., 3,564 cubic inches, and that a report be submitted to the conference to be held within three months' time."

As there was still some time before the lunch adjournment, the Chairman asked if there were any other matters that delegates wished to bring forward, and Mr. Aird (Bli Bli) pointed out the disabilities that growers were under in there being no fixed standard of quality for either insecticides or fungicides. Several delegates gave their experiences in this matter, and eventually, on the motion of Mr. Aird, seconded by Mr. Dakin, it was unanimously decided: "That it be a recommendation from this conference to the Minister for Agriculture that he introduce legislation for the purpose of standardising preparations used for the destruction of insect, fungus, and other pests."

The conference then adjourned for lunch, and on resuming business,—

Mr. Brown (Montville) read a very interesting paper on the advisability of enforcing the registration of orchards and strongly emphasised the need for registration in the interests of the growers.

Mr. W. E. Dean (Buderim) stated that they had come to the conclusion at a meeting a couple of weeks previously that it was necessary for something further to be done, and they thought a fee should be charged, the fee to be as light as possible on the small man or a man just starting, and to be on a sliding scale.

The Chairman gave an outline of the charges in Western Australia, and Mr. W. H. Parker of the registration charges in New Zealand.

Mr. Kuhn (Palmwoods) was opposed to the registration fee, as the growers in his neighbourhood were doing their best to combat the pests, and, in addition,

most of the citrus pests were to be found in the forests and scrubs surrounding their orchards, and for that reason he did not think the compulsory registration would have the desired effect.

Mr. Whiting stated that in his district the people kept their orchards clean, and so were not in favour of paying taxation to help to keep the other man's orchard clean.

Mr. Dakin (Thulimbah) referred to a meeting held in his district, where all the growers were in favour of some such action being taken, but when it came to the meeting of the affiliated societies in Stanthorpe the majority could not see their way to support the present proposition. He thought the matter was one which should be referred further for consideration, and that it was a matter for the sovereign body, when properly constituted, to make recommendations on.

Mr. Parker supported Mr. Dakin's opinion, and was of the opinion that the federated body, when properly formed, would propose legislation for themselves and tax themselves.

He referred to the unsatisfactory position in connection with the fruit-fly pest and the lure which had been discovered, and expressed the opinion that the Government should have the lure and sell it, making its use compulsory where the fly was prevalent. Even if it were supplied at cost price he did not consider the Government would lose anything over the transaction.

The Chairman also agreed with Mr. Dakin's opinion, and considered that when the growers realised the benefit that would accrue from the systematic destruction of pests they would fall in with the ideas of the Thulimbah association. He also refererd to the increase in the matter of the codlin moth in the Stanthorpe district during the present year, owing to a large extent to a lack of unanimity in fighting the pest. He would do his best, through his inspectors, to keep the Stanthorpe growers combating the pest, as otherwise it would be a serious menace to the growers of apples and pears.

Eventually, on the motion of Mr. Dakin, seconded by Mr. Brown, it was unanimously decided, "That this conference refer the question of amending the Diseases in Plants Act to the serious consideration of the Queensland Federated Fruit-growers' Association when that body has been properly constituted."

The Chairman referred to the investigations that had been carried out in connection with the fruit-fly lure and the efficacy of the lure in attracting the male and female flies, and called on Mr. Harvey, the discoverer of the lure, to address the meeting on the subject of his work.

Mr. Harvey, in response to the chairman's invitation, gave a very instructive outline of the discovery of the lure, and the experiments conducted in perfecting it and manufacturing traps with which to use it.

Mr. Paget (The Summit) stated that when the lure was finally placed on the market in a commercial form Mr. Harvey would find he had the growers at his back.

Mr. Harvey invited the growers at any time to submit their questions in writing, and he would be only too pleased to answer them.

On the motion of Mr. Paget, seconded by Mr. Brown, a hearty vote of thanks was accorded to Mr. Harvey for the able way in which he had put the matter before the conference, and the manner in which he had taken up the matter of the destruction of the fruit-fly.

The Chairman further referred to the work done by Mr. Harvey, and expressed the opinion that, as far as fixing the lure was concerned, he had been entirely successful. He also stated that, with the assistance of the Agricultural Chemist, he had been successful in emulsifying the lure and mixing it with various poisons.

Mr. Harvey expressed his intention of following the matter out to a successful issue.

General Matters.

The matter of the deputation that had waited on the General Traffic Manager was discussed at some length, and Mr. Dakin expressed the opinion, which was generally accepted, that the unsatisfactory unloading of perishable produce at Roma Street could not be rectified until more platform space could be provided and arrangements could be made for a staff to unload the fruit before the carters came to take it away.

It was pointed out that the amount of perishable produce damaged in the unloading and handling was a serious loss to the producers, and at the same time meant an increase in price to the latter.

Mr. Dean (Buderim Mountain) pointed out that a large percentage of the shortages reported—in the way of bananas, for instance—consisted of fruit damaged by the rough handling and left lying in the bottom of the trucks at Roma Street.

Mr. Parker was of the same opinion, as he had had the same experience with regard to consignments for his society.

Mr. Johansen considered more damage was done in this way than by the fruit-fly.

With regard to spraying for codlin moth, he thought it was too expensive to spray two or three times a year, but the Chairman considered it was only in exceptional cases that it would not pay to spray two or three times, if necessary.

Mr. Parker brought up the matter of timber for fruit cases and its export to the South, and informed the conference that the chairman was arranging to have a sample case of each timber suitable for the purpose to be on view at the forthcoming Interstate Conference of Fruitgrowers. He thought it was a matter of vital importance for the growers to get their timber as cheaply as possible, especially under present conditions.

Mr. Ellison also expressed his views on the matter of the export of case timber.

Mr. Mungill asked whether any of those attending the conference knew of an efficacious way of dealing with the "Rutherglen fly."

The Chairman was not aware of any definite remedy, even from Victoria, where it did an enormous amount of damage, but suggested the use of heavy masses of smoke.

Mr. Aird referred to the fly, which had been imported for the destruction of the lantana pest, and asked for information as to the result of the experiments carried out in Queensland, and as to whether the fly attacked other plants in the absence of lantana.

The Chairman promised to secure the desired information as soon as possible from Mr. Tryon, the Government Entomologist, and ask that Mr. Aird be communicated with direct by that officer.

Mr. Parker referred to the insects introduced into the State to combat the nut grass; and the Chairman stated that he had been informed of a species of mealy bug destroying nut grass, but the land had to be left idle for some considerable time to allow the insect to carry out the work.

Votes of thanks were unanimously accorded to the Chairman and Secretary and to the Land Court for the use of the room.

This concluded the business of the conference.

NOTES ON THE HANDLING, PACKING, MARKETING, AND GROWING OF PINEAPPLES.

By E. SMALLMAN, "Campsie," Ormiston, representing A.H. and I. Society, Wellington Point, read at the late Fruitgrowers' Conference held in Brisbane on 3rd and 4th April last.

CASES.

In making cases, always clench the nails in the ends, use sound timber only for the sides, and double-bank all thin timber, and do not be sparing of the nails. I use $1\frac{3}{4}$ by 13 nails.

MAKING.

Make the cases so that the lids are nailed on with the grain of the wood; this enables your agent to open them without damaging the timber to any great extent. Brand the end of cases, so that it will read right when the case is lid upwards; also brand lid and number of pines in case.

PACKING.

If obtainable, use dry blady-grass, which I consider the best for the purpose, as, if the fruit gets wet in transit, it will not suffer as much as if packed in softer grasses. Some growers pack in summer grass and other soft grasses; the fruit opens up with a very bad appearance if packed in these grasses, as the packing breaks up into powder.

I have known some growers to pack in newly-cut summer grass—can you expect a good result when these cases are opened up in the Sydney or Melbourne markets? If you have a patch of bananas, you will find the dead leaves make an excellent packing. During the recent drought I used this packing with good results. Avoid cutting the leaves too high, as the leaf-stalk is thick in the upper parts.

GATHERING FRUIT.

Cut with a knife, leaving a short length of stalk on the fruit, and handle carefully to avoid bruising. I carry off the fruit in baskets to a lorry. I prefer a lorry, as you can carry a quantity to your packing shed without piling them high enough to bruise the lower fruit. (Of course, you could not use a lorry on hilly ground.)

PACKING FRUIT.

I have a movable stand on which to place my case, and can pack directly from the lorry. I arrange the packing so that each fruit is surrounded with grass, with a good layer at bottom and top of case; by this means, whichever way the case has a bump, the grass forms a buffer and saves the fruit from damage. Never pack your fruit above the level of the case. How often you have seen the boards rounded on top of the fruit! Can you expect this fruit to be delivered in good order? The pines are bound to get flattened out in carriage, with the result that the juice is running out at the end of the journey and the fruit quite sour.

Although I have had to accept lower prices during gluts, I can say that I have never received such a low price that it did not give me a profit; this result is, I think, owing to the great care I have taken in packing the fruit. I think, when packing, you should put yourself in the place of the purchaser, or, in other words, follow the "Golden Rule."

BRAND.

Adhere to the brand you start with, and pack all your good fruit under this brand—second grade, you can have another brand for. The result is that your best fruit gets well and favourably known, and will be bought up from your agents without the cases even being opened. My Sydney agents inform me that my brand "Campsie" is now so well known that the fruit is often sold before the arrival of the consignment. The benefit to me is obvious. Should the consignments be heavy by this train or boat, my fruit would have been sold before the prices declined. I always advise agents as to quality of fruit and number of fruit in cases, so that they will get my letter before the arrival of the consignment. Very inferior fruit I never pack. Some years back I sold my fruit for twelve months for shipment to Coolgardie, West Australia. My contract was to wax stalks and paper the smooth-leaf variety, and pack in blady grass. I understood the fruit carried well and gave every satisfaction.

IMMATURE FRUIT.

The shipment of green fruit has been a great drawback to the pineapple industry. I think, if the growers would only keep some of the green fruit, such as they are packing, and try and eat it, say a week after, they would realise how they were imposing on the fruit-eating public.

I am hopeful that the shipping of this class of fruit may be prohibited at some future time, as it reacts on the grower and damages the whole trade. The other day, when walking through the markets with Mr. Gibson, we saw some Ripley Queen pines from my district that were so immature that they were quite unfit for any purpose whatever. At the present time, Ripley Queen pines (if coloured) are selling in Brisbane at a very high price; hence the temptation.

GROWING FRUIT.

Endeavour to grow large Ripley Queen and Rough-leaf pines and medium-sized Smooth-leaf (say, 15 to 18 per case). To keep down the size of Smooth-leaf, plant them close; the first crop of Smooth-leaf I planted 10 ft. apart and 1 ft. 6 in. in row (single rows). The result was that my fruit averaged 10 lb., many weighing 12 lb. This was a lesson to me, as, the fruit being so large, it met with a poor demand at low prices.

Botany.

LOMATIA SILAIFOLIA—A POISONOUS FLOWER.

By C. T. WHITE, Government Botanist.

Description.—A shrub, usually of 2 to 3 ft., the young shoots and flowering branches often hairy, with minute hairs. Leaves very much cut and divided, light green. Flowers white, conspicuous, in racemes or panicles (simple or branched sprays) at the ends of the branches. Fruit about an inch long, opening when ripe along one edge; seeds closely packed in the fruit, pale-brown, with a thin almost membranous wing.

Var. induta.—Differs from the normal plant in the under surface of the leaves being densely clothed with brown silky hairs.

Distribution.—Both the normal form and the variety are common plants on the sandy lands of the coast and on the ranges of South-eastern Queensland. The normal form is also common in New South Wales. So far as known the variety is confined to Queensland.

Poisonous Properties.—About a year ago Mr. C. A. Brown brought into the Department a number of flowering sprays of *Lomatia silaifolia*, and stated that he had observed that bunches placed on the tables attracted and killed flies. This observation was interesting, as A. G. Hamilton, writing in the "Proceedings of the Linnæan Society of N.S.W." (vol. xlii., p. 20), had recorded the fact that flies feeding on the nectar of Lomatia flowers died in numbers, and further stated that Dr. J. M. Petrie was of the opinion that hydrocyanic (prussic) acid was the cause.

At that time Mr. F. Smith and myself were engaged on an investigation into the distribution of hydrocyanic (prussic) acid containing compounds in the members of the Queensland flora; a number of flowering sprays of *Lomatia silaifolia* were obtained, and, on examination, gave strong positive tests for hydrocyanic acid, also on this and on several other occasions leaves were tried but always with negative results.* Dr. Petrie has also recorded negative results with this species, so it would appear that the poisonous properties reside wholly in the flowers.

To substantiate this I recently received specimens from Mrs. E. Geissmann, Tambourine Mountain, with the following notes:—"Under separate cover I am sending you a small branch of a shrub that grows (though not very plentifully) up here. It bears a white flower, and is very pretty to look at. We have (or rather had) one growing in the small paddock near the house, and during Monday we lost three poddy calves through eating some of it—at least we blame that, as there does not seem to be anything else that could cause it. We chopped the thing out, but would much like to know what it is, and whether it is known to be poisonous." On further inquiry, it was ascertained that the calves had nipped off and eaten the flowering branches.

Flowers of the variety *induta* were recently obtained, and in testing them these also yielded strong positive results for hydrocyanic acid.†

General Notes.—It is quite a handsome shrub, and has been introduced into European gardens, its finely cut foliage and pretty white flowers rendering it a desirable species for garden culture.

According to Dr. J. B. Cleland ("Proceedings of the Linnæan Society of N.S.W.," vol. xxxvii., p. 591), before the war *Lomatia* leaves were exported to Germany in bundles for decorative purposes.

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* Smith and White.—Proc. Roy. Soc. Queens., vol. xxx., p. 88.
† Smith and White.—Proc. Roy. Soc. Queensland, vol. xxxi.

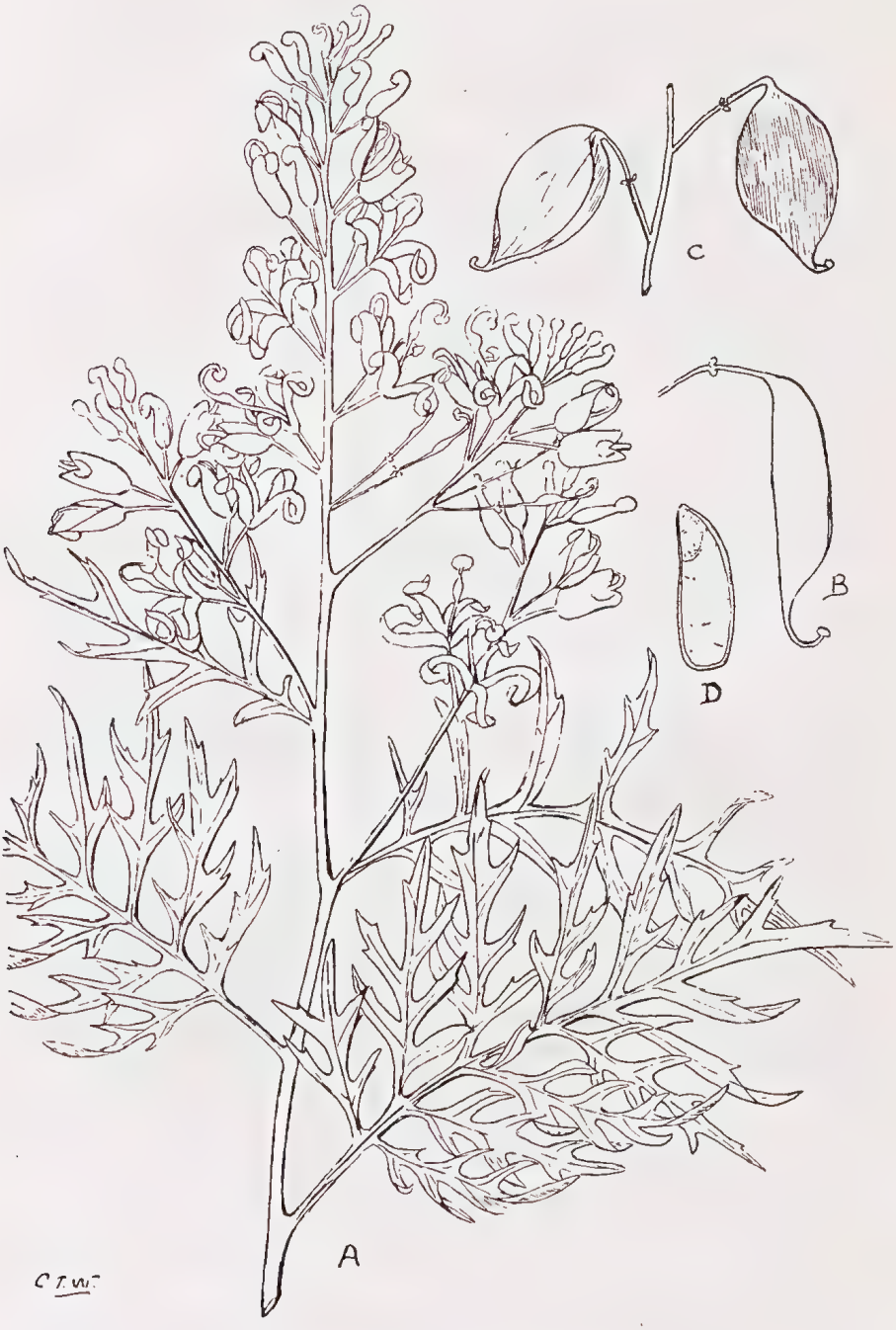


PLATE 24.—LOMATIA SILAIFOLIA.

(Flowers white.)

A—Flowering shoot.

B—Young seed capsule.

C—Old seed capsules from which the seed has been shed.

D—Seed with membranous wing.

(All natural size.)

Entomology.

CANE-GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report on Cane-grub Investigation from the Entomologist to the Bureau, Dr. J. F. Illingworth:—

"The abundant rains at the beginning of April have improved cane condition materially. Even the fields suffering from grubs have improved where they were not already too far gone.

"During the past month I made a survey of the Herbert River district, and found a most gratifying scarcity of grub-injury.

"HERBERT RIVER DISTRICT.

"This district, like the Mulgrave and most other cane areas, has suffered for want of rain, with the result that they will harvest only about half a crop. The lack of grub-injury this year is very fortunate. Even in the areas that were formerly badly infested they are not showing, and digging under the stools failed to reveal them.

"The only assignable reason for this immunity is that cultivation has been continuous because of the dry weather. The farmers in some areas told me that a good lot of beetles were on the wing, and the lack of foliage on the feeding trees in these localities bears out their statements. In several localities, however, where the beetles were very numerous in former years, they did not appear at all this last season —in fact, they have been scarce since the drought of 1915.

"During my limited time I was able to make a thorough survey of all the cane areas which had been infested in recent years through the generous assistance rendered by the officers of the Colonial Sugar Refining Company's mills. In very few places were we able to locate any grubs at all by digging under stools, and in no case were there enough to do serious harm. This is certainly remarkable, and must be due to the better cultivation this year.

"I had a communication recently from Mr. J. Wittrup, president Halifax Planters' Club, urging me to visit the district. He took me to several farms that had suffered in former years from grubs, but there is no indication that the crop is going to suffer this season. These farmers use meatworks manure, and the cane is of a fine dark-green colour.

"Mr. Wittrup called attention to a small field (A. Baxter's) lying alongside a forest of young Moreton Bay ash trees, which were almost defoliated. He told me that the beetles were exceedingly abundant in this timber, and that the cane never suffered from grubs. It is certainly a notable example of the relation of prevailing winds to infestation, for these feeding trees lie to leeward of the cane, and the country to windward is all open—not a tree within half a mile.

"Mr. W. Walker, at Ripple Creek, told me that he is ploughing up considerable numbers of grubs where he is turning down beans, and that the beetles were abundant on feeding trees near his house this year, but that the cane has never suffered on either side of the creek. The soil is rich alluvial deposit, which may possibly account for the immunity.

"Mr. Walker also remarked that the birds did good work on the beetles, which emerged over a very long period this year.

"The farm of D. and E. Mullans, near Hawkins's Creek, though not showing the usual infestation from grubs, has a most interesting experiment with sulphate of ammonia. They applied the chemical to twenty-two rows in a field of Badila ratoons, using about 2 cwt. per acre. The treated cane is a beautiful dark-green colour, and about double the size of the remainder of the field, which is very yellow. The fertiliser was applied at just the right time—after the rains started in January.

"The farm of Combo and Co., which lies in the same narrow valley, shows no sign of grubs in the places where they have appeared every year. Mr. Combo told me that he cut the feeding trees along the stream before the beetles flew in December. There are other feeding trees, however, within half a mile to windward, so I presume that the late cultivation has done as much here in making the cane free from grubs.

"A visit to the newer cane areas, far up the river on the Victoria side, revealed no infested fields, even where grubs did considerable damage last year. The dry weather has stunted the cane in places, but there is none of the characteristic yellowing caused by grubs.

"Mr. E. Freeman, cane inspector at Victoria Mill, called my attention to a farm belonging to Mr. M. Deloughery, in the 'Pocket,' which has produced seven crops of cane right among the trees without any cultivation at all. This farmer has had no trouble from grubs, and cuts 50-ton plant crop. The feeding trees are on every side. It is a case hard to understand, for Mr. Cole, on a farm alongside, cultivates his cane, and has had trouble from grubs since the second crop on new land. The scrub, with fig and other trees, is to windward, but Mr. Cole is having these cut out, so we shall have an opportunity to note the result upon future crops.

"Mr. W. Tooth told me that he has had trouble every year with grubs on his high ground, but none are showing this season, though feeding trees are abundant to windward.

"Mr. Tooth says that the cane laying near the scrub is not as badly infested as that on the ridge further back. This observation agrees with our experience, for the beetles naturally come to rest on these elevated spots.

"The distribution of grubs in not always easy to explain, but in every case where they have infested fields in former years there are feeding trees to windward within half a mile to account for their presence.

"It is interesting to note that none of these infested fields are in the older districts, where the feeding trees have been cleared away, though the land used to be infested in the early days.

"GREENHILLS ESTATE.

"Entering the plantation on the north, everything appears most favourable for a good crop; but as soon as one passes the high ground at the centre of the estate a terrible scene of devastation opens up. It looks as if a severe drought had struck it, in many places the tops being entirely dry. Fortunately, this year there has been no severe wind, and very little of the cane has fallen. The roots of these drying stools are all eaten off, however, and it is an easy matter to pull them over with one hand, for the soil is exceedingly friable.

"A bird's-eye view of the estate under these conditions is most instructive, for it shows decidedly what I have been trying to emphasise in recent reports—that infestation has a very definite relation to the prevailing winds and feeding trees. The part of the field adjoining the feeding trees, to windward, is often less injured than that of the higher ground further back, as I have noted above. Evidently the beetles, in their blundering flight, follow the lines of least resistance, and come to rest on any elevated area. At any rate, it is common experience that the high ground is most severely affected; it is always in these parts that the injury first appears, possibly because the soil is more leached out and poorer.

"It was most distressing to observe soon after I sent in last report, and before the refreshing rains, that the splendid cane of F3 was about to succumb. It will be recalled that part of this field was treated with a green crop of Mauritius beans, the effect of which was most remarkable upon the cane. The grubs were very noticeable in the untreated part of this field a month ago, but the cane of the treated portion continued a healthy green, and had every appearance that it was going to resist the attack. The dry weather continued too long, however, and this beautiful field went brown in a week. Evidently the extra humus of the beans was not enough to carry the grubs over the trying period. With abundant, normal rainfall, however, the cane would doubtless have come through in good shape. Anyway, the added humus staved off the injury for more than three weeks, thus showing that this is a step in the right direction.

"A second disappointment has been the field C3 treated with sulphate of ammonia. Like the beans, this chemical showed a marked stimulus to the crop, and at the time of writing last report I had great hopes for a successful result. The lack of rain, however, proved too trying, and the cane finally went yellow.

"Arsenic, at the rate of 10 lb. per acre, sprayed or dusted on the vegetation at the time of ploughing the ground preparatory to planting, is proved to be of little or no value in destroying the grubs. All the plots treated in this way have succumbed. It may be necessary to use more of the poison, but before we draw any conclusions we must wait the results of other experiments. Those we have under way would indicate that the poison has considerably more effect when applied near the roots of the young plants.

"ON THE VALUE OF CULTIVATION.

"Standing out in marked contrast to the surrounding devastated areas are the fields which chanced to get intensive cultivation at just the critical time. In each of these cases the planting was late (October), and necessarily the cultivation followed through the flight of the beetles. The field of first ratoons (lower half of L6) is showing most remarkable growth, and only slight infestation on one edge. It was cut in November, and the ratooning coincided with the flight of the beetles. It certainly now looks as if we would get another good crop in the midst of this infested area with no other treatment than proper cultivation.

"Then, too, the 40-acre field of plant-cane, J1, still has a fine dark-green colour, in marked contrast to the devastated fields on every side of it. Only in a few spots along the tramline is there any indication of grubs, and these do not appear to be spreading, for the recent rains have improved the colour and vitality.

"Digging shows that the grubs are beginning to go down; many of them are yellow, showing they have finished feeding, so the most of their devastation is probably over. Continued rains may possibly revive much of the injured cane if it has time to make new roots before it falls over.

"MERIMA PLOTS.

"These plots are located on high ground, where they suffer considerably from any continued drought. During the dry weather, in March, signs of grubs began to appear on the edges of several of the plots, but in no case has the yellowing extended further into the plots, and the indication now is that the critical period is past, and that we will have a fair cut. None of the injured cane has fallen, so with good rains it will all revive.

"It is interesting to observe that the cane in the plot treated with lime (CaO), at the rate of 1 ton per acre, has a beautiful dark-green colour—the best of all the plots, though the soil in that part of the field is rather poor, being on the highest ground. The meatworks manure appears to be attractive to the grubs, since there is considerable yellowing along the edge of this plot. On the other hand, meatworks manure, mixed with white arsenic, placed in the drill after planting, is showing good results; the cane is of good size, and shows little grub-injury, even where only 10 lb. of arsenic was used per acre. In the plot where 20 lb. of arsenic was used with 5 cwt. of meatworks manure per acre, no signs of grubs have yet appeared. It is too early yet to draw definite conclusions, but these indications are encouraging."

The General Superintendent of the Bureau of Sugar Experiment Stations, who is at present on an official visit to the North Queensland sugar areas, states, with regard to the Mackay district, that fine rains have recently fallen, which will go a long way to improve the present crop. The cane is now generally of a healthy colour, and growing well, though in places it is backward owing to the dry season. No regular wet season has been experienced this year, but the rains that have fallen have been of great service, and have kept the cane growing. The varieties at the Sugar Experiment Station have made excellent progress, especially Q813, Q903, Q1121, Q970, and H.Q.458. Some of the selected new Papuan canes are also doing well. At Plane Creek, upon the farm of Messrs. Brooks and Co., Q903 has grown a remarkably fine crop, and Q813 is also doing well. Great damage to cane in the Mackay district is being done by the bird known as the coot or redbill. It is anticipated there will be a fairly good crop at Mackay this season if the weather continues favourable.

At the Lower Burdekin district, due to the continued dry weather, the cane was very backward. Where irrigation had been carried out early the crops were very much better, but in the hope of the usual wet season setting in many farmers had postponed irrigation, and some of these were only now commencing to irrigate when the cane was showing signs of distress. Plantings were deficient last year, and, due to the immense crops harvested, much actual farm work fell behind. The yield, therefore, this year will be a small one, and it is at present doubtful if 120,000 tons of cane will be cut for the three mills. At the sugar experiment plot of Mr. Mackersie the new Papuan canes were making good progress, while the Queensland seedlings had done remarkably well. Some fine big cane of these varieties was seen at Mr. Craig's farm—viz., Q1121, Q813, and Q903. The Q813 was a 50-ton crop, and large quantities of this kind were being sent to Proserpine for plants. These varieties, raised by the Queensland Acclimatisation Society some years ago, were taken in hand by the Bureau of Sugar Experiment Stations, and after careful nursing were ultimately distributed. They appear to be giving excellent results from Bundaberg to the Lower Burdekin.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report on the application of molasses to sugar-cane from the Field Assistant, Mr. J. C. Murray:—

"With reference to the use of molasses by Mr. W. Jackson, of North Eton, this farmer has five varieties growing that have been treated with this product. The following is a list of the canes, and how treated:—

"*Badila.*—In preparing the ground for this variety, four ploughings were given, and the land treated with filter-press cake and molasses to the extent of 3,000 gallons per acre broadcast. After the first ratoon was cut the stools were treated with molasses by running along a dray with a tank on it and letting the molasses pour over the stools. The treatment made a great difference in the cane. In no case was the fertiliser (molasses) placed on land that had an acid reaction.

"Incidentally no harm is done to the earthworm by this treatment. Some stools of the Badila that happened to miss the molasses were a long way behind the others as regards growth, colour, and general appearance. This variety on Mr. Jackson's farm looks better than any other Badila in the Mackay district.

D.1135.—This variety was treated in the same manner as the Badila, but it is on a piece of land that is badly drained and inclined to acidity. No improvement noticeable.

"*Q.855.*—This variety has been treated in the same manner as the Badila. Mr. Jackson claims a great advance in tonnage and a heavier density since using molasses. The cane looks very healthy and strong.

"*H.Q.458.*—This variety has been treated in the same way as the others, and looks healthy and vigorous.

"*Q.813.*—This is a first ratoon crop, and will probably cut 30 tons to the acre. The land was treated in the same manner as the Badila.

"As regards the D.1135, the land showed an alkaline reaction when first treated with molasses in 1916, but it has since developed a slight acidity. Probably it should have had a heavier treatment of filter-press at the offset."

THE MANUFACTURE OF WHITE ARSENIC IN RHODESIA AND IN QUEENSLAND.

In view of the vast importance to Rhodesia and South Africa of having an assured supply of dip, and the manufacture of white arsenic on a commercial scale, a considerable amount of attention was devoted during 1917 to prospecting for arsenical ores, and large bodies of mispickel were found to exist within reasonable distance of a railway line which could supply South African requirements of arsenical compound for many years to come. The manufacture of white arsenic was brought to a successful stage early in 1918, and by the end of that year about 100 tons per month were produced, assaying about 99 per cent. As_2O_3, and it is interesting to note that this grade is obtained from the ore in one operation. The manufacture of arsenite of soda and dips has also been undertaken. Experiments in the recovery of arsenic as a by-product have been conducted in one of the Rhodesian goldmines, but the results are not yet obtainable.

In Queensland much attention has of late been given to prospecting for arsenical ores, and the high price ruling for arsenic stimulated its production in the Stanthorpe district, where the yield in 1918 was nearly 199 tons, of a value of £2,981 as compared with only 32 tons in quantity and £580 in value for 1917. The bulk of the output was from the Beecroft mine, near Sundown, and the remainder from the Orient leases at Carpenter's Gully. At the first-mentioned mine, where operations were continued throughout the year, the ore is treated by jigging and screening, and the concentrates, which are estimated to contain 30 per cent. arsenic, are despatched to Bendigo, Victoria.

In the State arsenic mine at Jibbinbar, in the Stanthorpe Field, the main shaft has been sunk (March, 1919) to 106 ft. An eastern cut No. 1 has proved the lode channel 11 ft. thick, and in No. 2 cut, 9 ft. thick. Both cuts carry a strong lode 2 ft. thick on the footwall. A concentrating and furnace plant are now in course of construction.

General Notes.

SOCIETIES, SHOW DATES, ETC., 1919.

BEENLEIGH.—Agricultural and Pastoral Society of Southern Queensland. F. W. Wuth, Secretary. Show dates: 11th and 12th September.

BOONAH.—Fassifern Agricultural and Pastoral Association. Show dates: 15th and 16th May.

CLERMONT.—Peak Downs Agricultral, Pastoral, and Horticultural Society. Show dates: 4th and 5th June.

GYMPIE.—Gympie and District Fruitgrowers' Association. Show dates: 27th and 28th August.

HERBERTON.—Herberton Mining, Pastoral, and Agricultural Association. Show dates: 21st and 22nd April.

LONGREACH.—Longreach Pastoral and Agricultural Society. F. C. Longworth, Secretary. Show dates: 6th and 7th May.

NORTH PINE.—The Pine Rivers Agricultural, Horticultural, and Industrial Association, G. W. Armstrong, Secretary. Show dates: 13th and 14th June.

PALMWOODS.—Palmwoods Fruitgrowers' Association, V. Bath, Secretary.

TAROOM.—Taroom Agricultural and Pastoral Association: Show dates: 13th and 14th May.

PERFECTION IN DISINFECTANTS.

It is stated that since the New York Department of Water Supply added a small amount of chlorine to the water not a single case of typhoid fever has occurred which could be traced to the city water. A far more remarkable achievement in water purification, however, is presented by the equipment devised by British chemists for the use of the army in France. It was so perfect that an equipment on a barge could pump foul water from a canal and deliver it in large quantities purified for drinking purposes. In view of the New York success, it is proposed that chlorinated water be used for sprinkling the streets to prevent the spread of infection. This proposal has been anticipated to some extent by the popular borough council in the East End of London, which for many years has provided, under the direction of the Medical Officer of Health, free supplies of such disinfectant produced by an electrical process. It is freely used for public baths and washhouses, for cleaning hospitals and other public institutions, for flushing drains, and for other sanitary purposes. Electricity is passed through a solution of certain salts, converting the liquid into an effective non-poisonous disinfectant which can be stored unimpaired for long periods.

ELECTRIFIED SEEDS IN GREAT BRITAIN.

During the 1918 harvest in Great Britain some remarkable results were obtained from "electrified seeds." Mr. H. E. Fry, an electrical engineer in Dorset, England, has developed a process of stimulating seeds so that they yield healthier and more prolific crops. The process consists of soaking the seeds in a solution of common salt, sending a current of electricity through the solution, and subsequently drying the seeds. Trials have been made with electrified wheat, barley, and oats in comparison with non-electrified seeds from the same sack and sown on adjoining ground. The electrified seeds threw up more straws, which were so much stronger than the normal that they withstood storms which laid the non-electrified harvest low. The gain in yield per acre varied in different parts of the country from 5 to nearly 20 bushels per acre for oats, and from about 5 to 7 bushels for wheat. Barley showed an increase of 16 bushels in another recorded case. Twenty-seven farmers in South Devon realised an average gain per acre of £4 13s. after deducting the cost of treatment, which is only a few shillings per sack. This, the latest British contribution to the promising science of electroculture is being investigated by the subcommittee of the Board of Agriculture of Great Britain, which is making a scientific study of the influence of electricity on plant life.—"Industrial Publicity Service, London."

A WORLD'S RECORD IN COMPETITIVE EGG-LAYING.

At the recent egg production held at the Hawkesbury Agricultural College, the outstanding feature perhaps is the total of 533 eggs laid in two years by a Black Orpington hen entered by Mr. C. Judson. This stands as a world's record in competitive laying. Mr. Judson, with a total for the two years of 2,789 eggs from six hens, is another Hawkesbury record, and by these two performances of his hens, he carries off both of the champion trophies offered for competition. His six hens laid eggs to the value of £15 8s. 2d., another record. In the first year's laying, the pick of Mr. A. Drayton's Black Orpingtons laid 324 eggs, which is the best individual score that has been achieved at the Hawkesbury. The aim is to beat the world's record, which is 336 eggs. When that has been achieved, the object will be to obtain 365 eggs in 365 days.

SOLAR OVENS.

In view of the scarcity of coal or wood in many tropical regions it is interesting to note the report recently made by Sir F. Nicholson, describing valuable experiments in the employment of solar ovens. These consist of stout teakwood boxes, blackened inside and fitted with a double glass top. They are suitably insulated, and with simple apparatus a temperature of from 240 degrees to 275 degrees Fahr. is easily obtained during the middle of the day from 11 a.m. to 3 pm., and 290 degrees with the aid of a single glass mirror. The oven once constructed, the "Journal of the Royal Society of Arts" points out, costs nothing, and for all mere baking or cooking purposes it is a very efficient and cheap utilisation of sun-heat, suitable for many applications. The disadvantage attached to the process—namely, the hours possible for hot meals being reduced to those in the hottest period of the day—must not be overlooked.

TO MEASURE FELLED TIMBER.

Simple Rule.—Take the girth of the timber round the middle with a string; one fourth part of this girth, squared and multiplied by the length, will give the solidity in cubic feet.

EXAMPLE I.

A log 20 ft. long is 36 in. round the middle; a fourth part of 36 in. is 9 in., the square of 9 in. is 81 in., therefore 81 in. or 6 ft. 9 in., multiplied by 20 ft. = 135 ft. cube; but to reduce that to our Australian standard measure, 135 cub. ft. must be multiplied by 12, thus 135 ft. x 12 = 1,620 superficial feet one inch thick.

In Australia sawn timber is always measured by the superficial feet, one inch thick, and all thicknesses except below ½ in. are reduced to the standard of 1 in. in thickness.

EXAMPLE II.

Two pieces of sawn timber 20 ft. long by 8 in. by 2 in. would be written thus:—8 x 2 Pine 2/20 = 20 x 2 = 40 x 8 = 320 ÷ 12 = 26 ft. 8 in. x 2 = 53 ft. 4 in.; or short, 20 x 2 x 8 ÷ 12 x 2 = 53 ft. 4 in. super., 1 in. thick.

EXAMPLE III.

6 x 2½ pine 5/10, 4/6, 3/9:

There are 5 pieces 10 ft. long = 50
There are 4 pieces 6 ft. long = 24
There are 3 pieces 9 ft. long = 27

101 x 6 x 2½

6

12) 606

50.6

2½

101.0

25.3

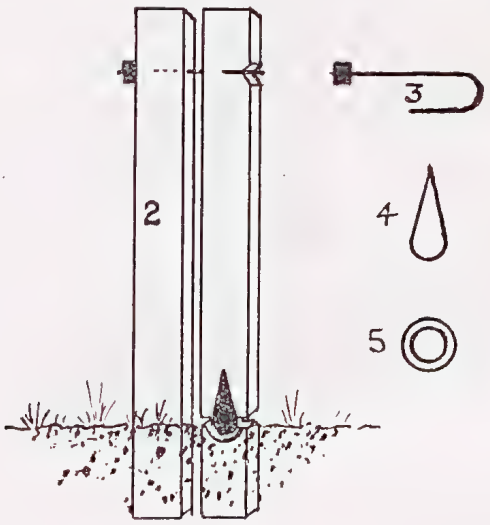
126.3 super. feet 1 in. thick.

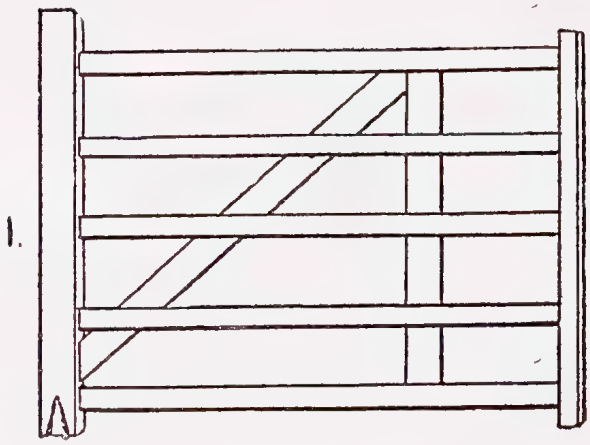
A USEFUL GATE HINGE.

Amongst the troubles of landowners, tenants of rented houses, and others is that of "sagging" gates. In all directions in the suburbs of our cities and towns gates are to be seen dragging on the ground owing to the posts being out of the perpendicular. Here is a simple way out of the difficulty, contributed by a correspondent of the "Farmers' Gazette." He writes:—

"It is on account of the hinge that I am sending this, although the gate is the strongest and lightest that I have seen. Having been a blacksmith for over twenty years before I went on the land, I think I am in a position to know the cheapest and most reliable hinge for any gate. I have made this kind for the heaviest dip gates, and the price was 2s. 6d. each. Other gates I have seen hung, and made the hinges and gate as high as 25s. for a double gate. I have also seen gates swung with these, and working just as smoothly after fifteen years' service. The beauty of it is that it does not wear the gate back, although this is what you would expect; it will not wear half an inch in ten years. The peg and ring are my own improvement. Being a blacksmith, it does not cost me anything, and makes a thorough job. Usually the gate is just rounded and put in the block in the old-fashioned way. If anyone is outback, a piece of fencing wire doubled a few times and put tightly around the post acts just as well as the round iron ring. In the gate you will notice that the stays only go three parts of the way across. The fault of most gates is that there is too much weight at the front, where it is not needed, and only makes it sag."

The figures supplied show that the gate is made up of 3 x 1 battens, placed side by side with ⅝-in. bolt through them, except the upright nearest the hinge, and that is 3 x 3 or 4 x 3.





TEE SISAL HEMP MARKET.

As we have advised intending growers of sisal in Queensland there are large stocks of this fibre in Mexico and in the United States of America, accumulated in consequence of the incidence of the war. In the former State, stocks amount to some 380,000 bales, and in the latter to 180,000 bales, while stocks of East African are full both in Britain and in Africa. The price has already fallen to 15 cents (7½d.) per lb., equal to about £70 per ton, in America, and in all probability will fall still more as soon as shipping space becomes available. There has lately been no business done in Mauritius hemp, several hundred bales having been offered at £65 per ton. Under present labour conditions there is no likelihood of any profit to be made in the sisal hemp industry. Some years ago, when there was no labour unrest, sisal sold at £24 per ton in Queensland left a handsome profit, but under present conditions there is more money in raising 1,000 sheep on the coast than in 1,000 acres of sisal. See "Sheep on Coastal Areas" in the issue of this *Journal* for June, 1919.

FEEDING VALUE OF LUCERNE.

A feeding trial was recently conducted in Nebraska, U.S.A., to test the claim that lucerne is equal to bran as a factor in a ration for cattle or sheep. Six pairs of cows were selected, each pair being made to match as closely as possible in breed, lactation period, previous record, milk flow, percentage of fat, and so forth. Then one cow from each pair was placed in one group called group A, and the other cow from each pair was placed in a second group, called group B.

Group A were fed on a grain ration consisting of four parts ground maize, two parts bran, and one part oil meal, and group B were fed on four parts ground maize, two parts chopped lucerne, and one part oil meal. At the end of fifteen days group A were put on to the lucerne ration, and group B on the bran ration. When another fifteen were passed group A were put back on to the bran and group B on to the lucerne, and fifteen days later again the changes were worked once more. The test was duplicated by being conducted twice—the first time from 1st December, 1916, to 30th January, 1917 (two months), and the second time (for three months) from 1st March, 1917, to 30th May, 1917.

During these periods, the milk from the cows was weighed daily, the butter-fat content ascertained, and the weights of the animals themselves recorded.

The cows while on the bran gave 22,886 lb. milk, containing 794 lb. butter fat, and lost 32 lb. in weight. The same cows during similar periods and under similar conditions, but receiving chopped lucerne instead of the bran, gave 22,741 lb. milk, containing 786½ lb. butter-fat and gained 240 lb. in weight.

Thus, there was a slight decrease in the total weight of milk and a loss of 7½ lb. butter, but this was more than overcome by the gain of 272 lb. in the weight of the cows. Evidently the lucerne was fully equal to the bran in feeding value.—"Pastoral Review."

CRUSHING DATES: 1919 SEASON.

The "Australian Sugar Journal" for 9th May publishes the following probable dates when cane crushing will begin in the Queensland sugar districts:—

Speaking generally, the crushing season this year will necessarily be later than usual, owing to the prolonged drought through which the country has passed; and it is still uncertain as to what mills will start in some of the southern districts, owing to the shortage of cane available. It has been estimated that of the total number of mills in Queensland, there are probably about ten which will not turn a roller this season. The following dates are of course liable to alteration, according to seasonal developments; but they are as near as can be ascertained at the time of going to press:—

Goondi	About middle of July
Mourilyan	Second week in July
Victoria (Herbert River)	24th June
Pioneer (Burdekin)	15th August
Inkerman (Burdekin)	5th August
Pleystowe Central, Mackay	Mid-July
Moreton Central, Nambour	Mid-August
Alberton	September
Steglitz Mill Co.	18th August
Kalamia (Burdekin)	Some time in July

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY, 1919.

Article.		MAY. Prices.
Bacon	lb.	9d. to 11d.
Barley	bush.	4s. 7d.
Bran (Warwick)	ton	£9
Broom Millet	„	£60 to £90
Broom Millet (Sydney price)	„	£75 to £90
Butter (First Grade)	cwt.	177s. 4d.
Chaff, Mixed	ton	£8 to £10 10s.
Chaff, Oaten	„	£10 to £10 15s.
Chaff, Lucerne	„	£9 15s. to £10 15s.
Chaff, Wheaten	„	£9 10s.
Cheese	lb.	11½d.
Flour	ton	£12
Hams	lb.	1s. 3d. to 1s. 10d.
Hay, Lucerne	ton	£7 10s. to £9 15s.
Hay, Oaten	„	...
Hay, Wheaten	„	...
Honey	lb.	4d. to 5d.
Maize	bush.	9s. 9d. to 10s. 3d.
Oats	„	...
Onions	ton	£14 to £18
Peanuts	lb.	5d. to 8d.
Pollard	ton	£6 5s.
Potatoes	„	£12 to £18
Potatoes (Sweet)	cwt.	9s.
Pumpkins (Cattle)	ton	£4 to £5
Eggs	doz.	2s. 3d. to 3s. 1d.
Fowls	per pair	4s. to 9s.
Ducks, English	„	3s. 6d. to 3s. 9d.
Ducks, Muscovy	„	4s. to 8s.
Geese	„	6s. 6d.
Turkeys (Hens)	„	11s. to 12s.
Turkeys (Gobblers)	„	20s. to 34s.
Wheat (Milling)	bush.	4s. 6d. to 5s.

VEGETABLES—TURBOT STREET MARKETS.

Beans, per sugar-bag	1s. 6d. to 3s. 3d.
Beetroot, per dozen bundles	1s. to 2s.
Cabbages, per dozen	2s. to 8s.
Carrots, per dozen bunches	1s. to 2s. 3d.
Cucumbers, per dozen	9d. to 1s. 6d.
Lettuce, per dozen	9d. to 1s.
Marrows, per dozen	9d. to 3s.
Parsnips, per dozen bunches	1s. to 2s.
Peas, per sugar-bag	7s. to 15s. 9d.
Potatoes (Sweet), per cwt.	9s.
Pumpkins (table), per cwt.	5s. to 7s.
Tomatoes, per quarter-case	7s. 6d. to 13s. 3d.
Turnips, per dozen bunches	4d. to 9d.
Turnips (Swedes), per cwt.	8s. to 10s.

SOUTHERN FRUIT MARKETS.

Article.	MAY. Prices.
Bananas (Queensland), per case	..
Bananas (Tweed River), per case	20s. to 30s.
Bananas (Fiji), per bunch	...
Bananas (G.M.), per bunch	...
Lemons, per bushel-case	4s. to 7s.
Mandarins (Queensland), per case	14s. to 16s.
Oranges (Queensland), per bushel-case	18s. to 22s.
Passion Fruit (Queensland), per bushel-case	8s. to 14s.
Pears, per bushel-case	9s. to 12s.
Pineapples (Queens), per double-case	20s.
Pineapples (Ripleys), per case	15s. to 18s.
Pineapples (Common), per case	8s. to 18s.
Tomatoes, per half-case	4s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel-case	10s. to 16s. 6d.
Apples, Cooking, per bushel-case	13s. to 15s. 6d.
Bananas (Cavendish), per dozen	4d. to 7½d.
Bananas (Sugar), per dozen	4d. to 7d.
Citrons, per hundredweight	16s.
Cocoanuts, per sack	15s. to 25s.
Custard Apples, per quarter-case	4s. to 8s.
Lemons (Lisbon), per quarter-case	7s. to 9s. 6d.
Mandarins, per case	9s. to 15s.
Oranges, per case	7s. to 12s.
Papaw Apples, per case	1s. 6d. to 6s. 6d.
Passion Fruit, per case	14s. to 17s. 5d.
Peanuts, per lb.	...
Pears, per case	8s. to 14s.
Persimmons, per quarter-case	...
Piemelons, per dozen	...
Pineapples (Rough), per dozen	1s. 9d. to 4s.
Pineapples (Smooth), per dozen	2s. 6d. to 8s.
Pineapples (Ripley), per dozen	3s. 6d. to 8s. 6d.
Rosellas, per sugar-bag	3s. 6d. to 5s. 6d.
Rockmelons, per dozen	...
Sugar-melons, per dozen	...
Tomatoes (prime), per quarter-case	8s. to 10s.
Tomatoes (inferior), per quarter-case	1s. 6d. to 3s.

TOP PRICES, ENOGGERA YARDS, APRIL, 1919.

Animal.	APRIL. Prices.
Bullocks	£19 10s. to £25
Bullocks (Single)	£27 10s.
Cows	£15 2s. 6d. to £20 2s. 6d.
Merino Wethers	40s.
Crossbred Wethers	45s. 6d.
Merino Ewes	38s.
Crossbred Ewes	37s. 3d.
Lambs	32s. 6d.
Pigs (Bacon)	101s.
Pigs (Porkers)	70s.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	MAY.		JUNE.		July.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5 0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·30	5·0	6·39	5·3	6·30	5·18
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·31	5·0	6·39	5·4	6·28	5·19
5	6·15	5·13	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6·32	5·0	6·39	5·5	6·27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·34	4·59	6·39	5·7	6·23	5·23
12	6·19	5·9	6·35	4·59	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5·25
15	6·21	5·7	6·36	5·0	6·38	5·9	6·20	5·25
16	6·21	5·6	6·36	5·0	6·38	5·10	6·19	5·26
17	6·22	5·6	6 37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·5	6 37	5·0	6·37	5·11	6·17	5·27
19	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
20	6·24	5·4	6·37	5·0	6·36	5·12	6·15	5·28
21	6·24	5·4	6·38	5 0	6·36	5·12	6·15	5·28
22	6·25	5·3	6·38	5·0	6·36	5·13	6·14	5·29
23	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6·26	5·2	6·39	5·1	6·34	5·14	6·11	5·30
26	6·27	5·2	6·39	5·1	6·34	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6·33	5·15	6·9	5·31
28	6·28	5·1	6·39	5·2	6·33	5·16	6·8	5·32
29	6·28	5·1	6·39	5·2	6·32	5·16	6 7	5·32
30	6·29	5·1	6·39	5·3	6 32	5·17	6·6	5·33
31	6·29	5·0	...	...	6·31	5·17	6·5	5·33

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

		H.	M.	
7 May	☾ First Quarter	9	34	a.m.
15 „	○ Full Moon	11	2	a.m.
23 „	☽ Last Quarter	8	4	a.m.
29 „	● New Moon	11	12	p.m.

The Moon will be at its farthest distance from the earth on the 14th, and at its nearest on the 29th, when there will be a total eclipse of the Sun visible in Africa and S. America, but not in Australia.

5 June	☾ First Quarter	10	22	p.m.
14 „	○ Full Moon	2	28	a.m.
21 „	☽ Last Quarter	3	33	p.m.
28 „	● New Moon	6	53	a.m.

The Moon will be at its farthest distance from the earth on the 10th, and nearest on the 26th.

5 July	☾ First Quarter	1	17	p.m.
13 „	○ Full Moon	4	2	p.m.
20 „	☽ Last Quarter	9	3	p.m.
27 „	● New Moon	3	21	p.m.

The Moon will be farthest from the earth on the 8th, and nearest on the 21th.

4 Aug.	☾ First Quarter	6	12	a.m.
12 „	○ Full Moon	3	40	a.m.
19 „	☽ Last Quarter	1	56	a.m.
26 „	● New Moon	1	37	a.m.

The Moon will be farthest from the earth on the 5th, and nearest on the 18th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during May, June, and July, and to the middle of August may be roughly arrived at by adding 20 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Orchard Notes for July.

THE SOUTHERN COAST DISTRICTS.

The notes for the month of June apply to July as well. The first crop of strawberries will be ripening during the month, though extra early fruit is often obtained in June, and sometimes as early as May, under especially favourable conditions. Look out for leaf-blight, and spray for same with Bordeaux mixture, also watch for the first signs of the grey mould that attacks the fruit, and spray with the sulphide of soda wash. The larvæ of the cockchafer, that eats the roots of strawberries, should be looked for, and destroyed whenever found. Pruning of citrus and other fruit trees may be continued; also, the spraying with lime and sulphur. Where the ringing borer, that either attacks the main trunks or the branches at or near where they form the head of the tree, is present, the main stems and trunks should either be painted or sprayed with the lime and sulphur wash during the month, as the mature beetles that lay the eggs that eventually turn to the borers sometimes make their appearance during the month, and unless the trees are protected by the wash they lay the eggs, which hatch out in due course and do a lot of damage. Keep the orchard clean, so that when the spring growth takes place the trees may be in good condition. There is usually a heavy winter crop of pineapples ripening during this and the following month, particularly of smooth leaves. See that any conspicuous fruits are protected by a wisp of grass, as they are injured not only by frost but by cold westerly winds.

THE TROPICAL COAST DISTRICTS.

See the instructions given for the month of June. Keep the orchards clean and well worked. Prune and spray where necessary.

THE SOUTHERN AND CENTRAL TABLELANDS.

Where pruning of deciduous trees has not been completed, do so this month. It is not advisable to leave this work too late in the season, as the earlier the pruning is done after the sap is down the better the buds develop—both fruit buds and wood buds; thus securing a good blossoming and a good growth of wood the following spring.

Planting can be continued during the month; if possible, it should be finished this month, for, though trees can be set out during August, if a dry spell comes they will suffer, when the earlier planted trees, which have had a longer time to become established, will do all right—provided, of course, that the land has been properly prepared prior to planting, and that it is kept in good order by systematic cultivation subsequent to planting.

Do not neglect to cut back hard when planting, as the failure to do so will result in a weakly growth.

As soon as the pruning is completed, the orchards should get their winter spraying with the sulphur limewash, and either with or without salt, as may be wished. See that this spraying is thoroughly carried out, and that every part of the tree is reached, as it is the main treatment during the year for San José and other scale insects, as well as being the best time to spray for all kinds of canker, bark-rot, moss, lichens, &c.

Where the orchard has not been ploughed, get this done as soon as the pruning and spraying are through, so as to have the land in good order for the spring cultivations. See that the work is well done, and remember that the best way to provide against dry spells is to keep moisture in the soil once you have got it there, and this can only be done by thorough and deep working of the soil.

When obtaining trees for planting, see that they are on good roots, and that they are free from all pests, as it is easier to prevent the introduction of pests of all sorts than to eradicate them once they have become established. Only select those varieties that are of proved merit in your district; do not plant every kind of tree that you see listed in a nurseryman's catalogue, as many of them are unsuited to our climate. The pruning of grape vines may be carried out in all parts of the tablelands other than the Stanthorpe district, where it is advisable to leave this work as long as possible, owing to the danger of spring frosts.

Where grape vines have been well started and properly pruned from year to year, this work is simple; but where the vines have become covered with long straggling spurs, and are generally very unsightly, the best plan is to cut them hard back, so as to cause them to throw out good strong shoots near the main stem. These shoots can be laid down in the place of the old wood in following seasons, and the whole bearing portions portion of the vine will be thus renewed.

Where vineyards have been pruned, the prunings should be gathered and burnt, and the land should receive a good ploughing.

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is then practically checked, and the young lucerne plants will, therefore, not be retarded by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time weeds once more appear it will be well able to hold its own against them. From 10 to 12 lb. of seed drilled, or 15 to 16 lb. broadcast, will be sufficient for an acre. This is also the time to prepare the land for many field crops, such as potatoes, maize, oats, and barley for green fodder; also, rye, vetches, tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes during this month in any districts liable to late frosts or in low-lying ground. Under such conditions, it is far better to wait until well into the following month. The greatest loss in potatoes and sugar-cane has been, on more than one occasion, experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and turmeric unearthed.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Sow Guada beans (snake gourd) at the end of September.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolor, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, paneratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

REVISED LIST OF AGRICULTURAL, HORTICULTURAL, AND PASTORAL SOCIETIES AND ASSOCIATIONS IN QUEENSLAND.

It is necessary that prompt notice be given to the Editor of changes in the Secretaryship of any Society or Association, a matter which is much neglected. Furthermore, information concerning dates on which shows are to be held must be forwarded to the Editor at least six weeks before the Show date. If these suggestions are not complied with, the Society whose Secretary neglects to supply the required information will be liable to be struck off the list of Societies published monthly in the Journal.

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1918.	1919.
Allora ...	Central Downs Agricultural and Horticultural Association	H. G. Deacon ...	20 and 21 Feb.	
Aloomba, *viâ* Cairns	Aloomba Farmers' Association ...	George Heap ...		
Alton Downs	Alton Downs Farmers' Association ...	G. T. Crook ...		
Amberley ...	Amberley Farmers' Progress Association	J. T. Goldsborough		
Applethorpe (S. Railway)	Applethorpe Fruitgrowers' Association	L. G. Longhurst ...		
Atherton ...	Atherton Table Land Agricultural Society	W. Morris	18 and 19 Sept.	17 and 18 Sept.
Ayr	Lower Burdekin Pastoral, Agricultural, and Industrial Association	C. G. M. Boyce ...	...	26 and 27 June
Ayr	United Canegrowers' Association ...	A. E. Dean ...		
Babinda ...	Babinda Canegrowers' Association	J. McLean... ...		
Bald Knob ...	Bald Knob Branch of the Queensland Farmers' Union	F. D. Young ...		
Balmoral ...			...	30 Aug.
Banyan, *viâ* Cardwell	Banyan and Tully River Agricultural Association	A. J. Harman ...		
Barcaldine ...	Barcaldine Pastoral Agricultural and Horticultural Association	W. A. R. Chambers	...	29 and 30 July
Barmoyea, *viâ* Rockhampton	The Caves Farmers' Progress Association	Thos. Ritchie ...		
Beaudesert ...	Logan and Albert Agricultural and Pastoral Society	M. Selwyn Smith ...	...	17 July
Beerburrum (Elimbah)	Beerburrum Fruitgrowers' Progress Association	A. Keers ...		
Beerwah ...	Beerwah and Coochin Creek District Farmers and Fruitgrowers' Progress Association	E. F. Jones ...		
Belmont ...	Belmont Agricultural, Horticultural, and Industrial Society	Daniel P. Bevan ...	...	23 Aug.
Biggenden ...	Biggenden Agricultural and Pastoral Society	C. J. Stephensen ...	28 June	26 and 27 June
Blackall ...	Barcoo Pastoral Society	W. P. Tieden ...	14 and 15 May	14 and 15 May
Blenheim, *viâ* Laidley	Blenheim District Farmers' Progress Association	J. L. Dart		
Boonah ...	Fassifern Agricultural and Pastoral Association	G. E. Ball	15 and 16 May	
Bowen ..	Bowen Farmers' Association... ...	G. E. Kent ...		
Bowen ..	Bowen Pastoral, Agricultural, and Mining Association	F. Sellars	29 and 30 Aug.	19 and 20 June

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1918.	1919.
Brisbane ...	National Agricultural and Industrial Association	J. Bain	12 to 17 Aug.	11 to 16 Aug.
Brisbane ...	Queensland Chamber of Agricultural Societies	J. Bain		
Brisbane (Box 616, G.P.O.)	The Horticultural Society of Queensland	J. S. Hook... ...	*	
Bucca (Kolan South), *viâ* Bundaberg	Bucca United Farmers' Association	W. D. Moore ...		
Buderim Mountain	Buderim Branch of the Queensland Farmers' Union	E. R. Nelson ...		
Buderim Mountain	Buderim Mountain Fruitgrowers' and Progress Association	A. V. Lindsay ...		
Bundaberg ...	Bundaberg Agricultural, Pastoral, and Industrial Society	Redmond Bros. ...	29 to 31 May	
Caboolture ...	Caboolture Pastoral, Agricultural, and Industrial Society	A. Toms	27 and 28 June	26 and 27 June
Cairns ...	Cairns Agricultural, Pastoral, and Mining Association	Nevitt and Boden	25 and 26 Sept.	24 and 25 Sept.
Canaga (Chinchilla)	Canaga Pastoral and Agricultural Association	W. H. Burnett ...		
Charleville ...	Central Warrego Pastoral and Agricultural Association	T. C. Fallis ...	...	27 and 28 May
Charters Towers	Charters Towers Pastoral, Agricultural, and Mining Association	A. H. Pritchard ...	2 and 3 July	8 and 9 July
Charters Towers	The Towers Horticultural Society ...	Jas. H. Chappel ...	21 and 22 Aug.	6 and 7 Aug.
Childers ...	Childers Pastoral, Agricultural, and Industrial Society	John R. Wrench ...		
Childers ...	Doolbi Canegrowers' Association ...	John R. Wrench ...		
Childers ...	Isis Primary Producers and Canegrowers' Association	John R. Wrench ...		
Chinchilla ...	Chinchilla Agricultural and Pastoral Association	W. L. Archer ...	...	28 May
Clermont ...	Peak Downs Pastoral, Agricultural, and Horticultural Society	A. S. Narrocott ...	...	4 and 5 June
Cleveland ...	Cleveland Agricultural, Horticultural, and Industrial Society	R. J. Hucker ...		
Clifton ...	Darling Downs Pastoral, Agricultural, and Industrial Association	P. G. A. Murphy...	20 and 21 March	3 and 4 Sept.
Coolum (Maroochy River), *viâ* Yandina	Coolum Fruitgrowers' Association ...	A. E. Short ...		
Cooroy ...	Cooroy West Farmers' Progress Association	F. Basing		
Coorparoo ...	Coorparoo Progress, Horticultural, and Industrial Association	W. D. Dell ...		
Crow's Nest...	Crow's Nest Agricultural, Horticultural, and Industrial Society	W. H. Carlile ...	2 and 3 April	15 and 16 July
Dalby ...	Dalby Pastoral and Agricultural Association	J. A. Hunter ...	31 July & 1 Aug.	29 and 30 April
Deeford (Dawson Valley)	Wowan-Deeford Branch of the Queensland Farmers' Union	C. J. Young ...		
Deeford ...	Don River Branch of the Queensland Farmers' Union	H. R. Brake ...		
Dirran ...	Dirran Settlers' Progress Association	Jas. Norris ...		
Doonan, *viâ* Eumundi	Doonan Ratepayers' and Farmers' Association	J. Simpson... ...		
Elimbah ...	Elimbah Farmers and Settlers' Progress Association	Chas. Rutter ...		
Emerald ...	Emerald Pastoral and Agricultural Society	W. B. Elgar ...	...	28 and 29 May
Eumundi (Oakey Ck.)	Kenilworth Farmers' Association ...	Gilbert B. Sutton		
Fletcher ...	Fletcher Fruitgrowers' Association	H. E. Land ...		
Gatton ...	Lockyer Agricultural and Industrial Society	...	...	10 and 11 July

* Show Nights: First Saturday in each month.

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1918.	1919.
Gayndah ...	Pastoral, Industrial, Agricultural, and Horticultural Association	E. M. Stephensen	2, 3, and 4 July	1, 2, and 3 July
Gin Gin ...	Gin Gin Agricultural, Pastoral, and Industrial Society	C. M. Morris ... Ploughing Match	5 and 6 June	28 and 29 May
Gladstone ...	Port Curtis Agricultural, Pastoral, and Mining Association	J. T. W. Brown ...	12, 13, and 14 June	26 and 27 June
Goomboorian	Goomboorian Branch of the Queensland Farmers' Union	M. Webster ...		
Goombungee	Goombungee Agricultural, Pastoral, and Horticultural Society	E. J. Moore ...	27 March	
Goondiwindi	MacIntyre Pastoral and Agricultural Society	J. S. Hall	23 and 24 April	13 and 15 May
Grantham (Lune Valley)	Ma Ma Creek Farmers' Union ...	Edwin Wilson ...		
Gympie ...	Gympie and District Fruitgrowers' Association	H. Sedgman ...		
Gympie ...	Gympie Agricultural, Mining, and Pastoral Society	F. W. Shepherd ...	28 and 29 Aug.	27 and 28 Aug.
Herberton ...	Herberton Mining, Pastoral, and Agricultural Association	J. H. Brownlee ...		
Highlands ...	Highlands Branch of the Queensland Farmers' Union	Alf. P. Wynne ...		
Hughenden ...	North Western Queensland Pastoral and Agricultural Association	H. P. Blackall ...	20 and 21 May	20 and 21 May
Ingham ...	Herbert River Pastoral and Agricultural Association	R. L. Jones ...	...	8 and 9 Aug.
Inglewood ...	Inglewood Agricultural, Pastoral, and Horticultural Society	J. F. Cheshire ...		
Inkerman	Inkerman Farmers and Graziers' Association	E. F. Ryan ...		
Innisfail ...	Johnstone River Agricultural Society	Jas. F. Edwards ...	...	3 and 4 Oct.
Ipswich ...	Ipswich Horticultural Society ...	S. H. Macartney / W. S. Johnston	...	21 and 22 May
Ithaca ...			...	26 April
Kamma (Cairns)	The Cairns Canegrowers' Association	C. V. Hives ...		
Kilcoy ...	Kilcoy Pastoral, Agricultural, and Industrial Society	A. R. Hooper ...	4 and 5 July	17 and 18 July
Kilkivan ...	Kilkivan Pastoral, Agricultural, and Industrial Association	M. O. Aronsten ...	...	4 and 5 June
Killarney ...	Killarney Agricultural Society ...	W. D. McGilvray...	27 and 28 Feb.	
Kingaroy ...	Agricultural, Pastoral, and Industrial Society	...	24 and 25 April	6 and 8 May
Kin Kin ...	Kin Kin Branch of the Queensland Farmers' Union	A. M. Gourgand ...		
Kolan River South, *vid* Bundaberg	United Farmers' Association, Bucca	W. D. Moore ...		
Koondai-i (Bell)	Koondai-i Dairymen's Association ...	Jas. Johnston ...		
Laidley ...	Lockyer Agricultural and Industrial Society	...	...	10 and 11 July
Landsborough	Bald Knob Branch of the Queensland Farmers' Union	F. D. Young ...		
Lawson, *vid* Wondai	Lawson Progress Association ...	J. Power		
Longreach ...	Longreach Pastoral and Agricultural Society	J. Forrest		
Lowood ...	Lowood and Tarampa Pastoral and Agricultural Association	Otto T. Sarkozanski	7 and 8 May	13 and 14 June
Mackay ..	The Pioneer River Farmers and Graziers' Show Association	Frank Black ...	...	25 and 26 June
Macnade, *vid* Lucinda	Macnade Farmers' Association	W. J. Enticknap ...		
Malanda ...	Millaa Millaa Settlers' Progress Association	S. S. Buckley ...	...	10 and 11 Sept.
Mapleton ...	Mapleton Fruitgrowers and Farmers' Progress Association	D. H. Story ...		
Manly ...	Manly Fruitgrowers' Mutual Benefit Association	J. Alcorn		

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1918.	1919.
Marburg ...	Marburg and District Agricultural and Industrial Association	F. H. Bielefeld ...	1 and 3 June	2 and 3 June
Mareeba ...	Mareeba and District Mining, Pastoral, Agricultural, and Industrial Association	Geo. H. O'Donnell		
Maroochy ...	Maroochy River Branch of the Queensland Farmers' Union	F. T. Latten ...		
Maryborough	Wide Bay and Burnett Pastoral and Agricultural Society	H. A. Jones ...	11 to 13 June	10 and 12 June
Minehan's Siding, *viâ* Townsville	Houghton River Farmers' Association	R. Walton		
Millaa Millaa, *viâ* Cairns	Millaa Millaa Settlers' Progress Association	T. W. Hanley ...		
Mitchell ...	Maranoa Pastoral, Agricultural, and Industrial Association	Neil Hammond ...	...	20 and 21 May
Montville ...	Montville Fruitgrowers and Farmers' Progress Association	T. H. Brown ...		
Mooloolah ...	Mooloolah and Glenview Branch of the Queensland Farmers' Union	J. Sapp		
Mount Gravatt	Mount Gravatt and District Agricultural, Horticultural, and Industrial Society	A. J. Trim... ...	...	26 July
Mount Larcom, *viâ* Gladstone	Wilmott Farmers' Progress Association	J. J. Kelly... ...		
Mount Morgan	The Mount Morgan Poultry and Kennel Club	Geo. Howard ...	7 June	5 and 6 June
Mundubbera	Boynewood and Derra Farmers and Settlers' Progress Association	Alfred Faint ...		
Murgon ...	Murgon Branch of the Queensland Farmers' Union	F. Gustafson ...		
Nambour ..	Maroochy Pastoral, Agricultural, Horticultural, and Industrial Society	J. J. Wilkinson ...	24 and 25 July	10 and 11 July
Nanango ..	Nanango Agricultural, Pastoral, and Mining Society	H. R. Richardson	6 and 7 March	1 and 2 May
Nerang .	Southern Queensland and Border Agricultural and Pastoral Association	E. Fass		
Noosa ...	Noosa Agricultural, Horticultural, and Industrial Society	D. J. L. Hartley ...		
North Pine ...	The Pine Rivers Agricultural, Horticultural, and Industrial Association (at Lawnton)	G. W. Armstrong...	21 and 22 June	
Oakey ...	Oakey Agricultural and Pastoral Society		...	8 Oct.
Oakey Creek, *viâ* Eumundi	Kenilworth Farmers' Association ...	A. Hughes		
Philpott Creek	Philpott Creek Farmers' Society ...	H. J. Brown ...		
Philpott Creek	Mundouran Pocket Farmers' Association	A. J. C. Mathieson		
Pine Rivers...			...	13 and 14 June
Pittsworth ...	Pittsworth Pastoral, Agricultural, and Horticultural Association	L. G. Sims ...	23 Jan.	11 Sept.
Pomona ...	Noosa Agricultural, Horticultural, and Industrial Society		...	6 and 7 Nov.
Proserpine ...	Proserpine Agricultural, Pastoral, and Industrial Association	A. G. Clarke ...		
Proserpine ...	Proserpine Farmers and Canegrowers' Association	M. A. Mackenzie...		
Proston ...	Proston Progress and Farmers' Association	T. M. Stephenson		
Ravenshoe ...	Ravenshoe Farmers and Graziers' Progress Association	W. R. Soilleux ...	5 Sept.	
Rockhampton	Rockhampton Agricultural Society...		...	19 and 21 June
Rocklea ...	Rocklea Agricultural and Industrial Association	D. Young	...	27 Sept.
Roma ...	Western Pastoral and Agricultural Association of Queensland	F. W. Mills. ...	...	13 and 14 May

AGRICULTURAL AND HORTICULTURAL SOCIETIES—*continued.*

Postal Address.	Name of Society.	Name of Secretary.	Show Dates.	
			1918	1919.
Rosewood ...	Rosewood Agricultural and Horticultural Association	A. J. Loveday ...	17 and 18 July	5 and 6 Sept.
Sandgate ...	Brighton Farmers and Fruitgrowers' Progress Association	A. E. Streeter ...		
Sarina ...	Sarina Branch of the Pioneer River Farmers and Graziers' Association	W. S. O'Grady ...		
Springsure ...	Springsure Pastoral and Agricultural Society	W. Fisher	22 and 23 May	21 and 22 May
St. George ...	Balonne Pastoral and Agricultural Association	Mark Roberts .		
Stanthorpe ...	Stanthorpe Agricultural Society ...	A. E. Bateman ...	7 and 8 Feb.	5 to 7 Feb.
Stanwell ...	The Stuart's Creek Farmers' Progress Association	W. H. Teakel ...		
Summit, S. Railway Line	The Summit Fruitgrowers' and Progress Association	B. Teale		
Takura, *viâ* Maryboro'	Takura Farmers' Union	C. Cordock ...		
The Gums, *viâ* Tara	The Gums and Horse Creek Pastoral and Agricultural Association	R. A. Markham ...		
Toogoolawah	Toogoolawah Pastoral, Agricultural, and Industrial Association	Douglas Young ...	...	5 and 6 June
Toombul ...	Toombul Agricultural, Horticultural, and Industrial Association	Percy C. Sapsford	6 and 7 Sept.	
Toowoomba...	Royal Agricultural Society of Queensland	G. Noble	16 to 18 April	6 and 8 May
Townsville ...	Townsville Pastoral, Agricultural, and Industrial Association	J. N. Parkes	10 and 11 July	2 and 3 July
Warwick ...	Eastern Downs Horticultural and Agricultural Association	H. Sterne	12 to 14 Feb.	13 and 14 May
Wondai ...	Wondai Agricultural, Pastoral, and Industrial Society	H. J. Compagnoni	22 and 23 May	
Wondalli ...	Wondalli Branch of the Queens'and Farmers' Union	C. R. Cameron ...		
Woodford ...	Woodford District Fruitgrowers' Association	H. C. Cowie ...	...	3 and 4 July
Woolooga ...	Woolooga and District Farmers' Progress Association	J. J. Platt		
Woombye ...	North Coast Agricultural and Horticultural Society	E. E. McNall ..	...	11 and 12 June
Woongarra ...	Woongarra Canegrowers and Farmers' Union	H. A. Cattermull..		
Woongarra, *viâ* Bundaberg	The Woongarra Canegrowers' Association (A.S.P.A. Branch)	R. O. Strathdee ..		
Yandina ...	Cooloolabin Farmers and Fruitgrowers' Association	A. Drummond ..		
Yandina Creek *via* North Arm, N.C. Line	Yandina Creek Farmers and Settlers' Progress Association	J. J. Simpson ...		
Zillmere ...	Zillmere Agricultural, Horticultural, and Industrial Society	A. B. Marquis ..		

* Postponed to 26th and 27th September.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1919.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5 0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·30	5·0	6·39	5·3	6·30	5·18
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6 31	5·0	6·39	5·4	6 28	5 19
5	6·15	5·13	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6 32	5 0	6·39	5·5	6 27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6 34	4·59	6·39	5·7	6 23	5·23
12	6·19	5·9	6·35	4·59	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6 22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5 25
15	6·21	5·7	6 36	5·0	6·38	5 9	6·20	5·25
16	6·21	5·6	6·36	5·0	6·38	5·10	6 19	5·26
17	6·22	5·6	6 37	5 0	6·37	5·10	6·18	5·26
18	6·23	5·5	6 37	5·0	6·37	5·11	6·17	5·27
19	6·23	5·5	6 37	5·0	6·37	5·11	6·16	5·27
20	6·24	5·4	6·37	5 0	6·36	5·12	6·15	5·28
21	6·24	5·4	6·38	5 0	6 36	5·12	6·15	5·28
22	6·25	5·3	6·38	5·0	6·36	5·13	6·14	5·29
23	6·25	5·3	6 38	5·1	6·35	5·13	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6 26	5·2	6·39	5 1	6·34	5·14	6·11	5·30
26	6·27	5·2	6·39	5·1	6·34	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6 33	5·15	6·9	5·31
28	6 28	5·1	6·39	5·2	6·33	5·16	6·8	5·32
29	6·28	5·1	6·39	5·2	6·32	5·16	6 7	5·32
30	6·29	5·1	6·39	5·3	6 32	5·17	6·6	5·33
31	6·29	5·0	...	...	6·31	5·17	6 5	5·33

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

		H.	M.	
7 May	☾ First Quarter	9	34	a.m.
15 „	○ Full Moon	11	2	a.m.
23 „	☽ Last Quarter	8	4	a.m.
29 „	● New Moon	11	12	p.m.

The Moon will be at its farthest distance from the earth on the 14th, and at its nearest on the 29th, when there will be a total eclipse of the Sun visible in Africa and S. America, but not in Australia.

5 June	☾ First Quarter	10	22	p.m.
14 „	○ Full Moon	2	28	a.m.
21 „	☽ Last Quarter	3	33	p.m.
28 „	● New Moon	6	53	a.m.

The Moon will be at its farthest distance from the earth on the 10th, and nearest on the 26th.

5 July	☾ First Quarter	1	17	p.m.
13 „	○ Full Moon	4	2	p.m.
20 „	☽ Last Quarter	9	3	p.m.
27 „	● New Moon	3	21	p.m.

The Moon will be farthest from the earth on the 8th, and nearest on the 24th.

4 Aug.	☾ First Quarter	6	12	a.m.
12 „	○ Full Moon	3	40	a.m.
19 „	☽ Last Quarter	1	56	a.m.
26 „	● New Moon	1	37	a.m.

The Moon will be farthest from the earth on the 5th, and nearest on the 18th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during May, June, and July, and to the middle of August may be roughly arrived at by adding 20 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.